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DONK (M. A.). **New and revised nomina generica conservanda proposed for Basidiomycetes (fungi).**—*Bull. Jard. bot. Buitenz.*, Sér. III, 18, pp. 83–168, 1949. [Received March, 1950.]

Alternations and additions are made to the nomina generica conservanda and confusa [*R.A.M.*, 29, p. 174] already proposed for Hymenomycetes (*Bull. Jard. bot. Buitenz.*, Sér. III, 17, 1, pp. 155–197, 1941). Both new and revised proposals are summarized in tabular form.

SHAW (C. G.). **The genera of the Peronosporaceae.**—Abs. in *Phytopathology*, 40, 1, p. 25, 1950.

Insufficient attention seems to have been paid to a character of importance in the differentiation of genera of the Peronosporaceae [*R.A.M.*, 3, p. 241; 29, p. 336]. The conidia of species of *Peronospora* are not provided with pores and germinate directly. Some are papillate, e.g., *P. destructor*, but even these are non-poroid. With the exception of those in the genus *Sclerospora*, all species in other genera of the family possess poroid conidia. In many species the conidia are also papillate, but this character, formerly used as a criterion, is not constant. Poroid conidia typically germinate indirectly. The poroid condition and the indirect mode of germination would seem to represent the more primitive status within the family. Should the poroid condition of the conidia be accepted as a valid character distinguishing *Peronospora* from other genera of the Peronosporaceae, the genus *Sclerospora*, as at present constituted, would need revision. It contains some species with apically poroid, indirectly germinating conidia, and others of the non-poroid type which germinate directly. The erection of two sections within the genus is therefore proposed, one for the species with non-poroid conidia and the other for the type, *S. graminicola*, and the rest of the species with poroid conidia.

HANSFORD (C. G.). **The method of parasitism of some South African Microthyriales.**—*Bothalia*, 4, 4, pp. 811–820, 14 figs., 1948. [Received January, 1950.]

The author investigated five species of South African Microthyriales, considered by E[thel] M. Doidge to be closely related (Revision of South African Microthyriaceae.—*Bothalia*, 4, p. 273, 1942). In view of the presence of an extensive internal mycelium and the apparent absence of functional hyphopodia *Asterina dissiliens* is returned to the genus *Asterinella* (*Ann. mycol., Berl.*, 22, p. 425, 1924); *Asterina inconspicua* and *Lembosia durbana* are renamed, respectively, *Asterinella inconspicua* n. comb. and *Echidnodes durbana* n. comb., although both species show a transition towards true ectoparasitism in so far as the hyphopodia are functional.

Proceedings of the first symposium on blister blight control.—*Tea Quart.*, 20, 3–4, pp. 97–148, 1949.

This is a full account of the proceedings of a symposium on tea blister blight [*Exobasidium vexans*] and contains reports, which have been noticed from other

sources [*R.A.M.*, 29, p. 175], on the present position and control of the disease in Ceylon [ibid., 29, p. 337], southern India [ibid., 29, p. 57], and Sumatra [ibid., 29, p. 58]. E. Hainsworth deals with the position in north-east India, G. K. Newton gives Agency House views on the blister blight situation, and K. Morford opinions on planting.

Marcelli (E.). **Osservazioni preliminari sulla specializzazione dell' 'Oidio' del Tabacco.** [Preliminary observations on specialization in Tobacco powdery mildew.]—*Notiz. Malatt. Piante, 1949*, 6, pp. 19–21, 1949. [Mimeographed.]

Plants and seedlings of the tobacco varieties Burley Giuseppina, Maryland di Cava, Kentucky, Virginia Bright, Perustitza, and Erzegovina, growing in a glasshouse at Scafati, Italy, and becoming naturally infected (severely) by powdery mildew (*Erysiphe cichoracearum*) [*R.A.M.*, 28, pp. 35, 209; 29, p. 60, and next abstract], developed perithecia. A number of different kinds of plants in the same house remained unaffected, except squash (*Cucurbita maxima*), the leaves of which developed slight infection. Morphologically the conidia found on squash were similar to those on tobacco. Cross-inoculations from tobacco to squash, watermelon, *Cucumis melo* [sweet melon], *C. anguria*, and cucumber caused infection only in *C. anguria*, which developed only the conidial state.

Cross-inoculations with conidia of *Sphaerotheca fuliginea* [ibid., 16, p. 364; 28, p. 379] on to squash, *C. anguria*, watermelon, sweet melon, and the above-mentioned tobacco varieties resulted in the development of the conidial and ascigerous states on all except *C. anguria* (on which only the conidial state formed) and the tobacco varieties [cf. ibid., 7, p. 273]. The fact that *S. fuliginea* is unable to parasitize tobacco explains why, in various parts of Italy, such as Perugia, Verona, and Rovereto, tobacco plantations show no trace of powdery mildew even when in close proximity to severely affected squash, which is probably affected by *S. fuliginea*, not *E. cichoracearum*. Further work is to be undertaken.

Marcelli (E.). **Prove sulla suscettibilità all' 'Oidio' di diverse specie e razze di Tabacco.** [Tests of the susceptibility to powdery mildew of different species and races of Tobacco.]—*Notiz. Malatt. Piante, 1949*, 6, pp. 21–24, 1949. [Mimeographed.]

In greenhouse studies at Scafati, Italy, three adult potted plants each of a large number of tobacco varieties and races, *Nicotiana rustica* races, and species of *Nicotiana* were maintained at 25° to 28° C. and 60 to 75 per cent. relative humidity, and left to become infected by *Oidium tabaci* [*Erysiphe cichoracearum*: see preceding abstract]. Every five days for 45 days the average infection on the three bottom leaves, then detached, was calculated for each set of three plants [cf. *R.A.M.*, 29, p. 59]. The final average disease ratings were: var. *lancifolia* 177, Xanthi Jakà 167, *virginica* 165, Perustitza 159, American Burley 154, *fructicosa* 146, *havanensis* 128, Burley di gran reddito 123, *brasiliensis* 121, Sumatra 116, Erzegovina 112, American Kentucky 111, Virginia Bright 109, Maryland di Cava 103, Resistente 142 100, *macrophylla* 93, and Maryland Riprodotto 88. After the plants had been in the greenhouse five days every variety and race of tobacco was affected. Infection generally appeared on the lowest leaves and spread to the topmost; the plants became completely infected, or very nearly so, in 30 to 45 days. *N. glauca*, *N. glutinosa*, *N. tomentosa*, *N. paniculata*, and *N. alata* remained unaffected; *N. sylvestris* had negligible infection on the two bottom leaves [cf. ibid., 13, p. 730]. A fortnight after the conidia had appeared, that is when damage is most conspicuous and most important economically, the average percentages of total leaf area affected were: Perustitza 86, *lancifolia* 75, *virginica* 75, Xanthi Jakà 74, *havanensis* 70, Erzegovina 60, American Burley 56, Virginia Bright 54, Sumatra 51, *fructicosa* 51, American Kentucky 51, *brasiliensis* 48, Resistente 142 45, Maryland di Cava

38, Maryland Riprodotto 37, Burley di gran reddito 36, and *macrophylla* 30 per cent.

These figures suggest that where the disease is endemic growers should plant Burley di gran reddito, Maryland di Cava, and Maryland Riprodotto, and, to a less extent, Resistente 142 and American Kentucky.

Gigante (R.). **La maculatura concentrica delle foglie di Tabacco.** [Concentric spotting of Tobacco leaves.]—*Ann. Sper. agr.*, N.S., 3, 5, pp. 1251–1261, 8 figs., 1949. [English summary.]

A description is given of a zonate necrotic spotting observed on the leaves of Maryland tobacco in an experimental plot at the Plant Pathology Station, Rome, in August, 1948. It is a non-parasitic disorder caused by excessive soil moisture and favoured by an excess of nitrogenous fertilizers and by potassium and phosphorus deficiency. The disease appears to be identical with 'black-fire' occurring in the United States [*R.A.M.*, 8, p. 408] and Southern Rhodesia [ibid., 8, p. 680].

Joly (M.). **Transformations du virus de la mosaïque du Tabac sous l'effet des traitements physiques et des interactions avec d'autres substances.** [Transformations of Tobacco mosaic virus under the influence of physical treatments and interactions with other substances.]—*Bull. Soc. Chim. biol., Paris*, 31, 1, pp. 108–110, 1949.

Birefringence of flow was found to constitute a very sensitive index for the measurement of tobacco mosaic virus particles [*R.A.M.*, 29, p. 177] at pH 4·5. The particles are of great mechanical fragility and their length is easily reduced in solution and by protracted freezing, although fractionation is partially reversible. It was further demonstrated by the same technique that when a concentrated solution of the virus separates into two layers, the upper phase is formed of shorter particles than the lower. The same method was applied to the study of the interactions between the tobacco mosaic virus and various other substances, which also affect the size and aggregation.

Alexander (L. J.). **Effect of Tobacco mosaic virus on yield of glasshouse and field grown Tomatoes.**—Abs. in *Phytopathology*, 40, 1, p. 1, 1950.

In an experiment to determine the effect of tobacco mosaic virus on tomato yields, plants in an unstaked plot remained healthy, but 13·2 per cent. of those in a staked plot were infected at the first picking of the fruit [cf. *R.A.M.*, 22, p. 500]. Yields from plants in staked plots were reduced by 0·5, 7·2, 8·1, and 11 per cent., respectively, for the 16th July, 18th June, and 29th and 10th May dates of inoculation, the corresponding figures for the unstaked being 17, 16, 21·8, and 26·4 per cent., respectively. For the same dates of inoculation the respective decreases in number of fruits per plant in the staked plots were 5·4, 11·3, 10·2, and 17·9, and in the unstaked 1·9, 0·2, 4·4, and 11·8. In a second test in a commercial glasshouse the yields in terms of pounds per plant from plants inoculated on 18th January, 23rd February, 29th March, and 12th April were 11·8, 12·96, 13·2, and 13·4, respectively.

Silberschmidt (K.) & Andrade (A. C.). **Anomalias no desenvolvimento e na produção de Tomateiros, causadas por nutrição inadequada.** [Anomalies in the development and production of Tomato plants caused by inadequate nutrition.]—*Arq. Inst. biol. S. Paulo*, 19, 9, pp. 117–148, 2 pl., 5 graphs, 1949. [English summary.]

A heavy drop in commercial tomato production in São Paulo, Brazil, during the winter of 1947 was associated with a disorder characterized principally by the partial or total failure of the opening of the flower buds, which subsequently shrivelled and fell. In older plants the two or three lower clusters bore no fruits,

while the few present on the upper clusters were mostly undersized or parthenocarpic. The middle leaves were abnormally short and frequently showed marginal rolling, and the apical leaf blades were reduced. A fully tabulated account is given of experiments to determine the eventual relation between these symptoms and the use of a commercial fertilizer containing potassium perchlorate, the toxic action of which was, in fact, shown to be responsible for the condition. Chilean sodium nitrate is known to contain from a trace to 0·94 per cent. perchlorates as impurities.

Conover (R. A.). **Rhizoctonia canker of Tomato.**—*Phytopathology*, 39, 11, pp. 950–951, 1 diag., 1949.

During the winter of 1948–9 *Rhizoctonia* [*Corticium*] *solani* caused widespread and frequently severe damage on vegetable crops in Florida. Losses of green-wrap tomatoes [*R.A.M.*, 22, p. 228; 24, p. 470; 27, p. 346] due to soil rot were exceptionally heavy, amounting to half of certain pickings in experimental plantings. Of special interest on tomato was the formation by the pathogen of cankers at the base of branches, no reference to which has been found in the relevant literature.

Under natural conditions the canker results apparently from the growth of *C. solani* into the stem through a leaf touching the soil. The outline of the canker ranges from subcircular to a partial or complete girdling band round the branch about the width of the leaf base. The lesions are often marked with alternating bands of dark brown to red brown and light brown or tan. The margin is sharply defined and the affected area is sunken. Girdled branches may wilt and are particularly liable to wind or mechanical injury. In a robust plant fungal penetration is apparently limited to the cortex and outer vascular cylinder. Decline of the plants, however, is accompanied by rapid invasion by the pathogen.

Sclerotia of the fungus were not present on the lesions, but they developed in profusion in culture. Inoculation tests with sclerotia or agar disks containing actively growing hyphae, made through slits in the petioles of healthy leaves, resulted in typical cankers from which the fungus was reisolated.

Hendrix (J. W.), Murakishi (H.), & Lyle (J. A.). **Defoliation diseases in Hawaii and experiments on their control.**—*Bull. Hawaii agric. Exp. Sta.* 101, 19 pp., 5 figs., 1950.

A description is given of the most important defoliation diseases of tomatoes in Hawaii, namely, grey leaf spot (*Stemphylium solani*) [*R.A.M.*, 28, p. 648], early blight (*Alternaria solani*) [ibid., 26, p. 534], late blight (*Phytophthora infestans*) [ibid., 28, p. 551], and *Septoria* leaf spot (*S. lycopersici*) [ibid., 29, pp. 63, 83, 180], which together cause annual losses of 20 per cent. Many farmers are forced to cease planting the profitable winter crops owing to the high incidence of defoliation during the cold season. Field spraying tests were conducted on Pearl Harbor and HES 3549 during three successive winters using nine, seven, and 12 applications respectively, at about 9-day intervals. In all tests the wetting agent Triton B–1956 was added (4 ozs. per 100 gals. solution).

Zerlate, at 2 lb. per 100 gals. water, gave excellent control of grey leaf spot, early blight, and *Septoria* leaf spot whenever these diseases prevailed. Fermate, tribasic copper sulphate, parzate, and yellow cuprocide likewise afforded effective protection. In the 1944–5 test carried out at Poamoho, Oahu, infections appeared late, and grey leaf spot and early blight were the only diseases causing extensive injury. The highest yields of marketable fruits were obtained from plots sprayed with zerlate (17·21 tons per acre), followed by tribasic copper sulphate (17·18), yellow cuprocide (15·71), and fermate (15·55), the unsprayed yielding 11·88. In the 1946–7 test at Poamoho, during which grey leaf spot and early and late blight were severe, the highest yields were obtained with zerlate (10·39), tribasic copper sulphate (8·68), dithane-zinc-lime (8·38), and fermate (8·03), the unsprayed yielding

4·96. In the 1948–9 test carried out at Makawao, Maui, all defoliation diseases were present except grey leaf spot; tribasic copper sulphate provided the highest yield (14·9), followed by yellow cuprocide (14·4), zerlate (13·66), and parzate (12·68), with 11·4 for the unsprayed.

The increase in value of the crops sprayed with zerlate were computed at $1,759 per acre in 1944–5 and $1,792 in 1945–6, and with tribasic in 1948–9 $826. The cost of spraying with the former fungicide was $153·8 per acre and with the latter $145·8.

NATTRASS (R. M.). **Tomato blight in Kenya.**—*E. Afr. agric. J.*, 15, 3, pp. 116–117, 2 pl., 1950.

Tomato blight (*Phytophthora infestans*) now occurs throughout the Highlands of Kenya [*R.A.M.*, 25, pp. 100, 154], where the crop is increasing in commercial importance. Plants raised during dry periods under irrigation may escape the disease, but dull weather with intermittent rain and high humidity favours outbreaks. Heavy dews are sufficient for further development of the fungus. It appears that infection spreads from infected potato tubers, or may be carried into the field with infected seedlings from the seed bed.

The recommended control measures include staking and spacing, and treatment with copper fungicides. Bordeaux mixture (4–4–50) and Burgundy mixture, in which the lime is replaced by 2½ lb. Magadi household soda, are suitable sprays; the latter leaves a thinner deposit than the former but causes some scorching of the small leaflets. For seedlings both fungicides should be used at half strength. Proprietary fungicides such as perenox, blitox, and coppesan [see next page] to all of which a dispersible sulphur (1½ to 2 lb. to 50 gals.) should be added, are also recommended. During the rainy season the first spraying should be given in the seed bed (or the young plants can be dipped in the fungicide at the time of planting out) and continued at 10- to 14-day intervals [ibid., 24, p. 337]. For larger plantations a machine delivering at least 60 lb. pressure is necessary. Dusting requires more frequent applications than spraying and is less effective.

ŠKORIĆ (V.). **Holandska bolest Briestova.** [Dutch Elm disease.]—*Hrv. Šum. L.*, 3, pp. 3–11, 6 figs., 1943. [German summary. Received March, 1950.]

This is a survey of the literature on Dutch elm disease (*Ceratostomella ulmi*), which was first noticed in Croatia in 1929 [*R.A.M.*, 14, p. 264]. The aspects dealt with include the symptoms, the causal fungus, its transmission, reaction of the elm species and varieties, and control.

BUGNICOURT (F.). **Sur une méthode de contaminations artificielles. Son application pour la recherche d'arbres résistants à certaines maladies cryptogamiques.** [On a method of artificial inoculation. Its application to the search for trees resistant to certain cryptogamic diseases.]—*Rev. gén. Bot.*, 57, 673, pp. 157–167, 2 pl., 1 fig., 1950.

A method is described for testing the resistance of trees to fungal diseases. When used to determine the resistance of *Hevea* rubber to *Phytophthora palmivora* the technique is as follows. Mycelium bearing numerous sporangia in a Van Tieghem cell filled with sterile water is chilled for 30 to 40 minutes, as a result of which zoospores are released. Vaseline is applied to the rim of the cell, which is then fixed against the trunk of the tree, so that the water containing the zoospores comes into contact with the tissues. The cell should be kept in place for three or four days. The relative resistance of clones or hybrids is assessed by noting the degree of infection according to a pre-determined scale about one month after applying the cell.

The method is being used to ascertain the resistance of *Cinchona ledgeriana* to a serious collar rot caused by a new species of *Phytophthora* and widely prevalent in Annam and Laos.

For Robusta coffee against a species of *Thielaviopsis*, recently observed to cause a typical hadromycosis in New Caledonia [ibid., 29, p. 363], phialospores of the fungus in water are applied in a cell as before; the conidia germinate rapidly at air temperature.

LENTZ (P. L.). **The genus Marssonina on Quercus and Castanea.**—*Mycologia*, 42, 2, pp. 259–264, 1 fig., 1950.

A fungus causing oak leaf spots in Texas and elsewhere in the United States (formerly *Marsonia quercina*) has been determined at the Bureau of Plant Industry as *Marssonina quercina* (Wint.) n. comb. (syn. *Gloeosporium septorioides* Sacc.). All the specimens studied occurred on leaves of the black oak [*Quercus velutina*] group. The conidial septum was observed by moistening a bit of the acervulus with alcohol and swelling with 2 per cent. potassium hydroxide solution. The material was stained with phloxine [*R.A.M.*, 29, p. 246] and crushed beneath the coverslip, after which glycerine and acetic acid were added. The cytoplasm pulls away from the septum which can then be clearly seen. The new combination *Marssonina ochroleuca*, not apparently previously transferred from *Marsonia*, is made.

ULM (AMANDA). **Remember the Chestnut!**—*Smithson. Rep., 1948*, pp. 377–382, 4 pl., 1949. [Received March, 1950.]

This historical survey of chestnut blight (*Endothia parasitica*) [*R.A.M.*, 29, p. 65] in the United States describes in popular terms the destruction caused by the disease, its introduction, early control attempts, distribution, and the breeding of resistant varieties.

GUERREIRO (G.). **Estudos realizados no Castanheiro em 1948.** [Studies conducted on the Chestnut in 1948.]—*Bol. Jun. Frut., Lisb.*, 9, 1, pp. 13–40, 14 figs., 2 graphs, 1949. [English and French summaries.]

Among the projects undertaken in connexion with the rehabilitation, development, and protection of the Portuguese chestnut forests in 1948 was the crossing of the indigenous *Castanea sativa* with the Japanese *C. crenata* in the hope of obtaining a type of tree resistant to *Phytophthora cambivora* [*R.A.M.*, 29, p. 234 and next abstract].

FERNANDES (C. T.). **A campanha contro a 'doença da tinta' dos Cástanheiros no ano de 1948.** [The campaign against the 'ink disease' of Chestnuts in the year 1948.]—*Bol. Jun. Frut., Lisb.*, 9, 1, pp. 41–66, 10 figs., 1949. [English and French summaries.]

In connexion with the campaign for the control of chestnut ink disease in Portugal [see preceding abstract], inoculation experiments were performed on three cultivated varieties of *Castanea sativa*, viz., Côta (13 trees), Judia (19), and Longal (15), on progeny of crosses between *C. sativa* and *C. crenata* (42), and natural hybrids (8). The inoculum consisted of six cultures, namely, CP, CS, G, H, B, and F. 27, of which the first four are assigned to *Phytophthora* group A [*P. cinnamomi*: loc. cit.] and the last two to group B [*P. cambivora*]. CP is Leonian's isolate of *P. cinnamomi*, CS is Pimentel's isolate of the same species, G and H are a species of *Phytophthora* isolated by the author, and F. 27 is Pimentel's isolate of *P. cambivora* [*R.A.M.*, 28, p. 366]. The following percentages of infection were obtained with the cultures of group A: Côta 78, Judia 57, Longal 45, *C. sativa* × *C. crenata* 24, and natural hybrids 0, the corresponding figures for B being 75, 100, 83, and 67, respectively (the natural hybrids were excluded from this series).

Very encouraging results have been given by treatments with copper carbonate [ibid., 29, p. 235] and a mixture of coppesan [ibid., 27, pp. 116, 194] (20 kg.), gypsum (20 kg.), and perenox (10 kg.). Spreader 'P' (Abecassis & Co.) at 3 in 1,000 was the

best of the adjuvants tested for use with copper carbonate, being non-caustic and adhering firmly to the bark.

Rex (E. G.). **A Dutch Elm disease control program for New Jersey for 1949.**—*Mon. Bull. N.J. Shade Tree Comm.*, 22, 1, 4 pp., 1949.

Bark beetle [*Hylurgopinus rufipes* and *Scolytus multistriatus*] control sprays should be applied to elms to prevent the spread of *Ceratostomella ulmi* [*R.A.M.*, 28, p. 652] immediately before the foliage appears. Three pounds of DDT per 50 ft. tree are necessary for adequate cover, and the cost of the insecticide would be $3 to 4 per tree. Such an expenditure is not usually economic, but the New Jersey Department of Agriculture strongly recommended in 1949 that trees in the following categories should receive at least 2 lb. DDT per average-sized tree: dead elms with tight bark and trees which showed Dutch elm disease symptoms in 1948 to be sprayed immediately before 15th April and 60 days later; trees developing symptoms in 1949 to be sprayed immediately upon the appearance of wilting and yellowing. The formula recommended is: DDT (technical grade) 102·5 lb., xylol (industrial grade) 41·3 gals., and triton X-100, 14·75 lb. One gallon of this solution contains 2 lb. DDT.

If diseased wood cannot be burned spraying should be effected with 2 per cent. DDT emulsion before 15th April. The optimism formerly expressed as to the reliability of DDT sprays for bark beetle control must be modified.

Marudarajan (D.), Ramakrishnan (T. S.), & Soumini (C. K.). **Wilt of Casuarina.** —*Curr. Sci.*, 19, 2, pp. 63–64, 1 fig., 1950.

A wilt disease of *Casuarina equisetifolia* has been observed over a period of years in Nellore, South Arcot, Tanjore, and Tinnevelly districts, India, and the fungus *Trichosporium vesiculosum* [*R.A.M.*, 27, p. 555; 29, p. 351] was often noticed on dead plants. Wound inoculations carried out at the Agricultural Research Institute, Coimbatore, in 1948 with pure cultures of the fungus induced wilt symptoms in four- to six-year old potted plants after six months and death after eight. Spores developed profusely under the bark. All the controls remained healthy. Infection, which probably occurs through natural ruptures in the bark, results from air-borne spores, developing profusely on dead trees. Trenching, previously recommended to isolate diseased areas, is unlikely to prove effective.

Jørgensen (C. A.) & Treschow (C.). **Om Bekæmpelse af rodfordærveren (Fomes annosus (Fr.) Cke) ved fladrodplantning og ved kalk- og fosfattilskud.** [On the control of the agent of root rot (*Fomes annosus* (Fr.) Cke) by superficial planting and the application of lime and phosphate.]—*Forstl. Forsøgsv. Danm.*, 19, pp. 253–284, 3 figs., 4 diags., 1948. [Received May, 1950.]

After summarizing previous laboratory and field studies by himself and collaborators on the causal organism of root and butt rot (*Fomes annosus*), by far the most destructive pathogen in Danish spruce forests [*R.A.M.*, 18, p. 772; 22, p. 120], the author describes experiments, in progress since 1942 in four State plantations, on the control of the disease by planting with the roots spread out flat, as practised in Norway [cf. ibid., 25, p. 193], and the application of lime or phosphate to the soil surrounding the stems. *F. annosus* is a weak parasite requiring dead tissue upon which to start growth [cf. ibid., 28, p. 655]. The object of superficial planting is to prevent the formation of a new tap-root, which tends to develop in response to the common method of unduly deep planting in holes with loosened soil and dies within 20 to 30 years, when it serves as a place of entry for the mycelium. The lime or phosphate amendments are intended to induce a permanent local increase in the pH of the soil round the trees, thereby impeding the approach of the mycelium, which is intolerant of alkalinity, to the main roots and the stem.

Preliminary results are encouraging, but since the depredations of *F. annosus* are not usually apparent in plantations less than 25 to 30 years old, a final verdict on the outcome of the treatments must be reserved.

DAY (W. R.). **Frost as a cause of die-back and canker of Japanese Larch.**—*Quart. J. For.*, 44, 2, pp. 78–82, 1950.

Descriptions are given of cases of severe frost injury resulting in a dying back of the crowns of Japanese larch [*Larix leptolepis*] in plantations in the Cotswold Hills and on chalky soil at Cranborne Chase, Dorset [*R.A.M.*, 25, 482; 27, p. 500]. Cankers (*Dasyscypha willkommii*) [ibid., 28, p. 656] have been observed from time to time on the main stems of trees in Hampshire, Merionethshire, Yorkshire, and Radnorshire. These types of frost injury differ from the equivalent types on European larch in that the cankers develop on the main stem after canopy has been formed instead of being initiated while the stem or branch is still small; the die-back takes place from the top of the tree instead of from the base of the tree upwards as a result of the girdling of the branches by injuries, which occur at some distance from the tip. These two aspects of die-back occur because spring frost attacks the European larch within the crown, and autumn frost damages the crowns of Japanese larch from the outside.

BUCKLAND (D. C.), FOSTER (R. E.), & NORDIN (V. J.). **Studies in forest pathology. VII. Decay in Western Hemlock and Fir in the Franklin River area, British Columbia.**—*Canad. J. Res.*, Sect. C, 27, 6, pp. 312–331, 7 pl., 1 map, 5 graphs, 1949.

Investigation into decay of western hemlock (*Tsuga heterophylla*) and fir (mainly *Abies amabilis*) [cf. *R.A.M.*, 28, p. 430] in the northwestern region of the Juan de Fuca forest, Vancouver Island, British Columbia, showed that the major pathogens responsible for root and butt rots in both species are *Poria subacida* [ibid., 28, p. 429], *Fomes annosus* [ibid., 27, p. 105], *Armillaria mellea* [ibid., 22, p. 231], *Polyporus sulphureus* [loc. cit.], and *P. circinatus* [ibid., 20, p. 328]. The most important fungi causing trunk rots of western hemlock are (in decreasing order) *F. pinicola* [ibid., 27, p. 207], *F. pini* [loc. cit.], *Stereum abietinum*, *F. hartigii* [ibid., 22, p. 231], and *Hydnum abietis* [ibid., 27, p. 547]. Those causing trunk rots of fir, in decreasing order of importance, are *F. pinicola*, *S. abietinum*, *H. abietis*, *F. pini*, and *F. hartigii*. In 59 per cent. of the cases studied the fungi had entered through wounds.

SCHULZE (B.) & THEDEN (GERDA). **Versuche zur Trockenstarre des im Holz befindlichen Myzels von Bauholzpilzen.** [Experiments on the 'dry immobility' of the mycelium of fungi found in the wood of structural timber.]—*Phytopath. Z.*, 15, 4, pp. 482–494, 1 diag., 1 graph, 1949.

A tabulated account is given of experiments undertaken to determine the environmental conditions under which the mycelia of wood-destroying fungi retain their viability in desiccated material [cf. *R.A.M.*, 29, p. 3]. Pine blocks were exposed to infection by known fungus species and strains under controlled conditions and examined after maintenance for varying periods at certain temperatures and relative humidities for the renewed growth of the pathogens.

A number of the organisms showed considerable resistance to temporary desiccation, the viability of *Poria vaporaria*, for instance, being unimpaired after $1\frac{1}{2}$ years' drying over anhydrous calcium chloride (the most exacting of the methods used). Other resistant species included *P. contigua*, *Lenzites abietina*, *L. sepiaria*, *Lentinus lepideus*, *Polystictus versicolor*, and an unidentified agent of blue stain. On the contrary, the viability of *Coniophora cerebella* [*C. puteana*] and more particularly of

Merulius lacrymans decreased progressively with lengthening periods of desiccation and sudden (as opposed to gradual) and drastic methods of drying.

DAY (W. C.), PELCZAR (M. J.), & GOTTLIEB (S.). **The biological degradation of lignin. I. Utilization of lignin by fungi.**—*Arch. Biochem., N.Y.*, 23, pp. 360–369, 1949.

In tests to determine the ability of 35 cultures of white rot fungi to utilize native lignin [cf. *R.A.M.*, 29, p. 68], many exhibited growth response when lignin was the limiting source of carbon in the medium. However, the results from these screening experiments could not be clearly evaluated because of variations in growth in duplicate cultures and other irregularities. When *Fomes geotropus*, *Lentinus tigrinus*, *Polyporus* [*Polystictus*] *abietinus* [ibid., 18, p. 561], *Poria subacida* [ibid., 27, p. 547], *Daedalea unicolor*, and *Peniophora gigantea* [ibid., 27, p. 301] were subjected to prolonged growth in a lignin-glucose medium, in which the glucose was gradually diminished to zero, *Poria subacida* and *Polystictus abietinus* consistently produced an appreciable amount of growth on a solid or liquid medium (both of chemically defined composition except for the agar in the former) in which lignin was the limiting source of carbon. *F. geotropus*, *L. tigrinus*, and *Peniophora gigantea* showed no evidence of adaptation to lignin utilization and *D. unicolor* little or none.

KOPWILLEM (J.). **Höganäs coal-tar oil as a wood preservative.**—*Tidskr. tekn.-vetensk. Forskn.*, 20, 2, pp. 50–60, 16 figs., 1949.

A tabulated survey is given of tests by the agar and wood block (spruce and pine) methods at the Höganäs—Billesholms AB Central Laboratory, Sweden, to determine the toxicity to *Lentinus lepideus*, *Coniophora cerebella* [*C. puteana*], *Poria vaporaria*, *Trametes serialis*, and *Polyporus* [*Polystictus*] *versicolor* of Höganäs coal tar oil and its derivative håbinol. Both products were shown to be highly toxic to the fungi tested, and their resistance to leaching and evaporation was likewise satisfactory.

OGILVIE (L.). **Diseases of vegetables.**—*Bull. Minist. Agric., Lond.*, 123, [ii+] 73 pp., 12 pl. (4 col.), 1949. 3*s.* 6*d.*

This is the third revised edition of Bulletin 123 [*R.A.M.*, 21, p. 59].

WALKER (J. C.). **The mode of seed infection by the Cabbage black rot organism.**—Abs. in *Phytopathology*, 40, 1, p. 30, 1950.

Studies in the progress of *Xanthomonas campestris* in cabbage seedlings showed that a considerable period may elapse between infection of young plants or those approaching the head stage and the development of external symptoms [*R.A.M.*, 20, p. 331]. The maximum amount of seed infection occurs in very mildly affected seed plants, outward signs appearing about the time the seed is in the dough stage. Systemic infection then proceeds by way of the xylem of the peduncle, siliqua, and funiculus to the seed coat.

PLANT (W.). **Use of lime and sodium molybdate for the control of 'whiptail' in Broccoli.**—*Nature, Lond.*, 165, 4196, pp. 533–534, 1950.

In experiments carried out at centres in Cornwall and Wales it has been found that the application of lime or sodium molybdate [*R.A.M.*, 29, p. 54] to acid soils prevents 'whiptail' in cauliflower [ibid., 29, p. 282] and broccoli, a condition which is prevalent in acid soils in most of the market-garden districts of southern England and Wales. At two centres in Cornwall applications of sodium molybdate at 2 lb. and 4 lb. per acre and ground limestone at 3 tons per acre reduced 'whiptail' in Roscoff 2 broccoli from 39 and 31 per cent. in untreated plots at two centres to 8

and 5, 2 and 0, and 5 and 7 for each treatment, respectively. The molybdenum and manganese contents of the leaves collected prior to curding were for the untreated 0·08 and 410 p.p.m., and for the treated 0·32 and 150, 0·39 and 215, and 0·35 and 40, respectively. Molybdenum seems to be of low availability in certain acid soils and liming, if necessary, is correct when cauliflower or broccoli are to be grown. 'Whiptail' on neutral soils indicates soil deficiency and addition of molybdenum would be required.

SIMON (M.). **Le manganèse et la Betterave sucrière.** [Manganese and Sugar Beet.]—*Publ. Inst. belge Amélior. Better.*, 17, 6, pp. 211–220, 5 figs., 1949. [Flemish and English summaries.]

Although the position as regards manganese deficiency in the Belgian sugar beet-growing districts [cf. *R.A.M.*, 27, pp. 410, 583; 28, pp. 158, 610] is not immediately disquieting, the disorder does appear to be more prevalent. To assist growers in the recognition of the trouble a summary is given of the available information on the distribution of the element in the soil; the relations between the crop and manganese, comprising observations on the symptoms of deficiency and excess and the effect of the former on yields; and control by means of soil amendments with manganese sulphate.

ERNOULD (L.). **Les ennemis de la Betterave en Belgique, en 1949.** [The enemies of the Beet in Belgium in 1949.]—*Publ. Inst. belge Amélior. Better.*, 17, 6, pp. 221–230, 10 figs., 1949. [Flemish and English summaries.]

Beet mildew (*Peronospora schachtii*), hitherto reported only in a sporadic form in Belgium, caused heavy and widespread damage from the end of May to mid-July in 1949, necessitating repeated applications of copper sprays in some districts. A comparable situation prevailed in Holland. Cercosporiosis [*Cercospora beticola*] appeared late (mid-August), but it developed rapidly over large areas during the warm and rainy September, causing heavier losses than in the preceding year [*R.A.M.*, 29, p. 344]. Rust [*Uromyces betae*] occurred in an equally severe form in mid-September.

In the Tirlemont district virus yellows [loc. cit.] was observed as early as 28th June in a field adjoining a number of workmen's gardens containing infected winter spinach, which was no doubt responsible for the outbreak. By August the disease was prevalent in all areas. Dissemination was effected in the earlier part of the season primarily by *Myzus persicae* and in the later by *Aphis fabae*. Yellows was particularly destructive in Flanders and Hainault. Besides the 'mild' and 'etch' yellows described from England [and Eire: ibid., 28, p. 264], a third form of the disease, or possibly a new virus, characterized by discoloration of the veins [ibid., 28, p. 202], has been observed in Belgium, where its incidence rose from between 0·2 and 0·5 per cent. in 1948 to 1 to 3 per cent. in 1949.

Heart rot [boron deficiency], which was virtually absent in 1948, caused substantial damage in 1949, especially in the Limburg region of Hesbaye, where little is known regarding preventive treatment with borax.

ERNOULD (L.). **La maladie de l'étranglement de la Betterave.** [The strangling disease of Beet.]—*Publ. Inst. belge Amélior. Better.*, 17, 6, pp. 231–236, 8 figs., 1949. [Flemish and English summaries.]

In many of the Belgian sugar beet fields inspected in the spring of 1949 the above-ground part of the plants was broken off at soil-level. The disease, known as 'strangling', is attributed to adverse weather conditions, such as night frosts and drying winds, at thinning time. Affected plants are characterized by abnormally curved petioles in contrast to the normal erect habit. Although the agents of black leg (*Phoma betae*, *Pythium* [*debaryanum*], and *Aphanomyces* [*levis*]: cf. ibid., 29,

p. 343) may sometimes be present on the 'strangled' plants, they are definitely not the primary cause of the disturbance. Stands should be sufficiently dense to guard against losses from 'strangle' and other juvenile troubles.

Steudel (W.). **Über Auftreten und Ausbreitung der virösen Rübenvergilbung in Elsdorfer Versuchsfeld und ihre Beziehungen zum Massenwechsel der Überträger in zwei Extremjahren.** [On the occurrence and dispersal of Beet virus yellows in the Elsdorf experimental field and its relations to mass fluctuation of the vectors in two extreme years.]—*NachrBl. dtsch. PflSchDienst.* (*Braunschw.*), 1, 12, pp. 166–171, 5 graphs, 1949.

The results of studies begun in 1947 and pursued during 1948 on the movements of the aphid vectors in relation to beet yellows virus at Elsdorf, Rhineland [*R.A.M.*, 28, p. 609], revealed the importance of meteorological conditions as a factor in the etiology of the disease. In 1947 the period from May to August, the most critical both for crop growth and aphid development, was hot and dry, in 1948 cool and damp. In both years the first symptoms of yellows appeared about five weeks after the onset of colonization, i.e., in 1947 during the first ten days of July and in 1948 on 15th June. The two species concerned locally in the transmission of the disease are *Doralis* [*Aphis*] *fabae* and *Myzodes* [*Myzus*] *persicae*, the former being the more important. Under adverse weather conditions, in fact, *M. persicae* is almost entirely absent from the crop, whereas in warm seasons it can multiply appreciably, producing numerous winged forms on beet plants. However, even under favourable conditions the summer flight of *M. persicae* began later and was numerically smaller than that of *A. fabae*. Evidently, therefore, the possibilities of yellows transmission will vary greatly according to whether *A. fabae* develops alone or in association with a considerable population of *M. persicae*.

Neither in 1947 nor in 1948 could *A. fabae* be demonstrated as overwintering in the parthenogenetic phase on herbaceous plants, and during the severe winter of 1946–7 *M. persicae* also failed to survive. In 1947–8, however, imagines of the latter species could be observed throughout the winter on field and garden plants.

McKeen (W. E.). **A study of Sugar Beet rootrot in southern Ontario.**—*Canad. J. Res.*, Sect. C, 27, 6, pp. 284–311, 5 pl., 4 graphs, 1949.

In southern Ontario sugar beet root rot is associated with *Aphanomyces cochlioides*, *Pythium aphanidermatum*, *P. ultimum* [*R.A.M.*, 28, p. 556], and *Rhizoctonia* [*Corticium*] *solani*, all of which are fully described. The fungi were found only in the top soil and *A. cochlioides* and *P. ultimum* were most abundant in the upper 2 in. *A. cochlioides*, the agent of black root, is the most important economically. When black root appears as an early acute epidemic, infected seedlings younger than two weeks are killed. Seedlings two to five weeks old may recover under favourable conditions. There may be a later chronic phase [ibid., 27, p. 4] but this does not occur in southern Ontario. Serious outbreaks develop only when moisture is abundant and soil temperature exceeds 60° F. *A. cochlioides* does not grow at relative humidities less than 99 per cent. Susceptibility is sharply correlated with seedling development, and ends when the cortex of the hypocotyl is sloughed off. Infection probably takes place through the stomata of the hypocotyl. The intercellular position of the mycelium would tend to support this hypothesis. The pathogen invades only the cortical tissue of the seedling, but may spread into the cortex of the root. No strain differences were obtained. The microflora in the rhizosphere of diseased seedlings was considerably larger than in that of healthy ones, probably due to the utilization of necrotic tissues.

Streptomycin [ibid., 29, p. 271], applied as seed treatment (10 cc. water to 1 gm. crystalline streptomycin), was very effective in controlling root rot, and the potential significance of antibiotic substances as fungicides is stressed.

Wells (D. G.), Walker (J. C.), & Hare (W. W.). **A study of linkage between factors for resistance to wilt and near-wilt in garden Peas.**—*Phytopathology*, 39, 11, pp. 907–912, 1949.

A tabulated account is given of studies at the University of Wisconsin to determine the linkage relations of some genes controlling reaction to the wilt and near wilt diseases of peas (*Fusarium oxysporum* f. *pisi* race 1 and *F. o.* f. *pisi* race 2, respectively) [*R.A.M.*, 28, p. 558; 29, p. 191]. Evidence is presented suggesting that these factors are associated with a loose linkage of 40·2±3·4 per cent. as determined from back-cross data from the two crosses under investigation (Thomas Laxton × Delwiche Commando and Davis Perfection × Delwiche Commando). The F_3 data denoted independence of the two factors involved, but this information is less reliable than the back-cross results.

In breeding programmes concerned with the production of new varieties resistant to near wilt, parental stocks have been used for crossing with Delwiche Commando (resistant to both races of *F. oxysporum* f. *pisi*), or with related selections that are either wilt-resistant or susceptible to both diseases. In crosses between varieties resistant to wilt but differing in reaction to near wilt, the presence or absence of linkage between Fw (factor pair for reactions to wilt [ibid., 9, p. 423]) and Fnw (the symbol herein adopted for the factor pair governing near wilt resistance, susceptibility being represented by fnw) would be of no significance. In the latter type both factors for resistance would enter the cross from the same parent, and in the event of close linkage a larger proportion of the progenies than expected on the basis of independence would be resistant to both diseases. This favourable situation, however, is unlikely to arise in breeding for wilt and near wilt resistance because of the loose linkage suggested by the results of this study.

Fw was found to be associated with the factor for internode length, Le, in combined back-cross and F_3 data with 35·1±2·9 per cent. of recombination [loc. cit.], whereas Fnw was apparently inherited independently of the Le locus. Assuming Fw and Fnw to be on the same chromosome, the latter does not lie between the former and Le but to one side of this pair of genes.

Wilson (R. D.). **Molybdenum in relation to the scald disease of Beans.**—*Aust. J. Sci.*, 11, 6, pp. 209–211, 1949.

Having reason to believe that bean (*Phaseolus vulgaris*) scald [*R.A.M.*, 29, p. 192], like cauliflower whiptail [ibid., 28, p. 500, and above, p. 393], which occurs in the same area of New South Wales, might be a molybdenum deficiency disease, the writer carried out field experiments to determine the effect of sodium molybdate solutions on the amount of oxidizing materials in the interveinal areas of diseased plants. Significant reductions were obtained within a few days, accompanied by the development of a healthy green colour [cf. ibid., 28, p. 372]. In one trial, for instance, tests with diphenylamine-sulphuric acid on 30 disks of interveinal leaf tissue 8 mm. in diameter gave the following figures for blue colour intensity, measured by visual comparison with prepared standards of aqueous solutions of Nile blue sulphate three to five minutes after placing a disk in 2 ml. of the reagent: untreated, 167·2±17·4; plants watered six days earlier with sodium molybdate at the rate of 0·1 gm. in ½ pint water per yard of row, 0·3±0·11. Significant differences also resulted from the application of the compound in dosages as low as 0·0001 gm. per yard (¼ oz. per acre).

Combined with the evidence regarding the association between seed origin and scald, the responses of affected plants to molybdenum suggest that deficiency of this element is responsible for the condition, which develops only when the supply from both seed and soil is inadequate.

Wade (G. C.). **Disease of Broad Beans and Tick Beans.**—*Tasm. J. Agric.*, 21, 1, pp. 28–32, 5 figs., 1950.

In Tasmania the most serious disease of broad and tick beans is leaf spot, caused by a fungus closely resembling *Ascochyta pisi* var. *fabae* [*R.A.M.*, 26, p. 375]. During the last two years the disease has become increasingly prevalent, and it has now been reported from all sections of the State where these crops are grown. On many occasions damage has been very severe and has resulted in the complete failure of seed and fresh bean crops. The disease often reduces the growth of tick bean cover crops in orchards, and in some cases has caused almost complete losses. Control consists in the use of clean seed, burning infected plants as soon as they are seen, and spraying regularly with Bordeaux mixture (4–4–40) or applying a copper dust. Infected crops should be burnt or fired rather than ploughed in, and the ground not used for these crops for at least three seasons.

Rust (*Uromyces fabae*) [ibid., 27, p. 116; 28, p. 45] is common, but not usually serious except in late crops. It occurs chiefly after harvest. Mosaic [cf. ibid., 18, p. 649; 26, p. 372] is widespread but not of major importance.

Hildebrand (A. A.) & Koch (L. W.). **Observations on six years' seed treatment of Soybeans in Ontario.**—*Sci. Agric.*, 30, 3, pp. 112–118, 6 graphs, 1950.

From 1943 to 1948, inclusive, A. K. Harrow soy-bean seed, which varied from year to year in its germination and disease potentiality (*Peronospora manshurica* and hilum canker) [*R.A.M.*, 28, p. 154], was treated with spergon, arasan, fermate, phygon, phygon-XL and F-800 (2, 4, 5-trichlorophenyl chloroacetate) and planted in outdoor plots in Ontario. In 1943 only, when seed with germinating capacity of 23·4 per cent. and 40 per cent. visibly diseased was used, and with spergon alone, were emergence and yield increased significantly, from 19·4 per cent. (untreated) to 43·8, and from 25·89 bush. per acre to 32·07, respectively. An increase of 10 bush. per acre in 1948 was apparently correlated with an adequate, well distributed rainfall.

Cooper (W. E.). **Two virus diseases of Peanuts.** —Abs. in *Phytopathology*, 40, 1, p. 6, 1950.

Groundnuts in North Carolina are affected by two virus diseases, one designated as 'mild' and the other as 'severe' mosaic. The mild form consists of a faint, chlorotic mottle or spot patterns, with little stunting or foliar distortion. It first appears on a few scattered plants early in June, and by August nearly all the plants in some fields show symptoms. The Virginia Bunch and Virginia Runner are attacked throughout the north-east of the State. The severe mosaic is characterized by an intensive chlorotic, sometimes necrotic pattern, with pronounced stunting and distortion of the leaflets and dwarfing of the plants if infected when young. It usually occurs on isolated plants, though indications of spread through the field have been observed. Both diseases have been transmitted from infected to healthy groundnuts by the carborundum rubbing method and by cleft grafts, the latter in a modified form in which Scotch tape was closely folded round the union. Aphid transmission is also suspected on the basis of preliminary studies.

Fabricatore (Jolanda A.). **Intumescenze su frutti di Cocomero (Citrullus vulgaris L.).** [Intumescences on Watermelon (*Citrullus vulgaris* L.).]—*Ann. Sper. agr.*, N.S., 3, 5, pp. 1263–1269, 4 figs., 1949. [English summary.]

During August, 1948, a high percentage of the watermelons on sale and in the field in Venetia showed two diseases which caused severe losses to the growers. The most prevalent disorder appeared on immature fruits as pale green pustules which enlarged to about 0·3 to 0·5 cm. in diameter and turned brown as the fruit

approached maturity. They originated in one of the cortical layers, in the vascular tissues, or in the outer layers of the pith, and brought about cell hypertrophy. The tissues forming the intumescences eventually turned yellow-brown. The pustules occurred chiefly on fruits touching the soil. The disorder is considered to be connected with high humidity of an exceptionally rainy season. The weather conditions also favoured the development of rosy-grey ring spots caused by *Colletotrichum* sp.

Dickson (R. C.), Swift (J. E.), Anderson (L. D.), & Middleton (J. T.). **Insect vectors of Cantaloupe mosaic in California's desert valleys.**—*J. econ. Ent.*, 42, 5, pp. 770–774 , 1 graph, 1949.

At least three viruses were found to be implicated in the etiology of cantaloupe mosaic, which has been responsible for heavy damage to early summer melons in the Imperial Valley of California in recent years [*R.A.M.*, 29, p. 245]. Of a total of 179 collections from 53 stations comprised in a survey of the Imperial and Palo Verde valleys, six were assigned to cucumber virus 1 [cucumber mosaic virus], 13 to a cucumber virus with a very similar host range to that of squash mosaic virus, and 160 to the last-named [ibid., 20, p. 189].

The spread of the disease is effected by transient aphid populations, chiefly of *Myzus persicae*, which represented 80·8 and 52·5 per cent. of the species caught on sticky-board traps in 1948 and 1949, respectively. The insects came from sugar beet fields and weeds, chiefly *Chenopodium* and *Malva* spp., and moved across the melon plantings in swarms. Each aphid fed for only about 40 seconds on a single plant, traversing the field in a series of short flights and visiting a considerable number of plants in succession. This type of feeding is so highly efficient in the dissemination of the virus that an extremely low initial incidence of infection was very rapidly increased. Thus, in tests to determine the relative capacity of the green peach aphid for the transmission of the virus after long and short (under one minute) feeding periods, three out of 20 plants (15 per cent.) contracted the disease in the former and 39 out of 50 (78 per cent.) in the latter series. *Aphis medicaginis*, *A. maidis*, *Macrosiphum solanifolii*, and *M. pisi*, which were ineffectual after lengthy feeding, transmitted 60, 5, 40, and 20 per cent. infection, respectively, after short periods.

Experiments in the control of the disease by the use of insecticides or repellents gave negative results.

Borzini (G.). **Ricerche sperimentali sulle terre usate in Italia per il ricoprimento dei 'letti' di coltura di Psalliota spp.** [Experiments on the soil used in Italy for the casing of culture beds of *Psalliota* spp.]—*Ann. Sper. agr.*, N.S., 3, 5, pp. 1111–1124, 2 figs., 1949. [English summary.]

In experiments carried out at the Italian Cryptogamic Laboratory, Pavia, mycelium of the 'Bianco 312' race of mushroom (*Psalliota campestris*) cultivated in Italy was grown from spores in an artificial compost in bottles, and half used for inoculating compost in cylindrical pots. These were covered with 1·5 cm. of the casing soils [*R.A.M.*, 27, p. 61] under test, which were obtained from different parts of Italy. Distilled water was added until it penetrated to the mycelium, further water being added periodically to standardize the soil humidity. The bottles containing the rest of the mycelium were maintained at 16° C. at 90 per cent. relative humidity for about 20 days and finally at 11° to 12° and 90 to 92 per cent. relative humidity. The mycelium was then added to the pots on top of the casing soils.

The mycelium spread with ease through all the soils tested, although more slowly in soils which had a rather high calcium content. The factors promoting rhizomorph formation are not necessarily the same as those promoting the production of mushrooms.

From the results the principal casing soils used by Italian mushroom growers appear to be (*a*) those inducing rapid rhizomorph and mushroom formation, (*b*) sandy soils which have a similar effect but the production of fruiting body initials is not followed by their appearance in a more or less developed condition, and (*c*) those which under the conditions of the experiment did not stimulate the production of rhizomorphs, fruiting body initials, or mushrooms. These last-named were a highly calcareous soil and sterilized siliceous sand.

Atkins (F. C.). **The tray system in Great Britain.**—15 pp., 7 figs., 2 diags., Mushroom Growers' Association, Yaxley, Peterborough, 1950. 2*s.* 6*d.*

The author includes in this paper the original article by J. W. Sinden on mushroom growing in trays (*Bull. Mushroom Grs' Ass.* 9, 1947), which is a brief report of the system in the United States of America [cf. *R.A.M.*, 29, p. 244]. In Great Britain the method is gaining in popularity and it is described in detail, especially with regard to mechanization, cost, spawning, peak heating, and casing.

Atkins (F. C.). **Mushroom growing to-day.**—187 pp., 28 pl., 23 figs., London, Faber & Faber, Ltd., 1950. 12*s.* 6*d.*

This work by a leading grower deals comprehensively with every aspect of mushroom cultivation in private garden, nursery, and specialist farm. It contains sections on the 'background' to mushroom growing, mushrooms as a sideline, specialist requirements, the technique of growing, diseases and pests (pp. 144–164), and other matters.

Reitsma (J.) & Hadiwidjaja (T.). **Handleiding voor het kweken van de Rijstchampignon (Volvaria volvacea (Bull.) Quélet).** [Handbook of instruction for the culture of the Rice Mushroom (*Volvaria volvacea* (Bull.) Quélet).]—*Landbouw, Buitenz.*, 21, 10–11, pp. 558–564, 3 figs., 1949.

Full directions are given for the several procedures involved in the culture of the edible fungus *Volvaria volvacea* in Java [cf. *R.A.M.*, 27, p. 9].

Nichols (R. F. W.). **The brown streak disease of Cassava. Distribution, climatic effects and diagnostic symptoms.**—*E. Afr. agric. J.*, 15, 3, pp. 154–160, 5 pl., 1950.

Cassava brown streak virus disease [*R.A.M.*, 27, p. 63] is reported to be endemic in all East African coastal areas from the north-east border of Kenya to the Portuguese border in the south. Following an inspection of areas which used planting material from Bukalasa Station, Uganda, complete replacement of stocks was carried out where the disease was well established, and repeated roguing undertaken in others. It is not regarded as a serious problem, as there has been very little secondary spread over the 15-year period, except at Serere and Kaberamaido, where a strict quarantine of six months was imposed, followed by complete replacement of all stocks. It is difficult to understand why there was no large-scale transmission of the disease by the insect vector (*Bemisia* sp.) [ibid., 22, p. 7] in areas below 3,000 ft. where conditions are well suited to spread. In Nyasaland [ibid., 28, p. 271] brown streak is particularly prevalent near the Portuguese border. Symptoms [ibid., 16, p. 87] appear on mature leaves, stems, fruits, and roots, on one organ only or more, depending on the susceptibility of individual clones. The presence or absence of symptoms in these organs is constant for any given clone. On mature or nearly mature leaves two types of chlorosis occur; one appears first along the margins of the secondary veins, and extends on either side of the primary vein, and subsequently along the tertiary veins. Later the chlorotic light yellow areas coalesce to form blotchy patches, often involving the greater part of the lamina. The second type, which is more common, is a mottle, more or less evenly distributed over the whole leaf surface. In extreme cases the whole leaf is blotchy. The lower, severely

affected leaves present a striking appearance in contrast to the green young foliage. They may remain attached for several weeks, but are shed in periods of drought or during the cool season. In clones with low tolerance brown to black streaks first develop on the young stem; they elongate and coalesce, forming blotchy patches. The next stage is characterized by the formation of necrotic, sepia or black lesions in the leaf scars; they increase in size, finally killing the dormant buds. They persist and are the most reliable, single, diagnostic symptom. The last stage in stem infection occurs only in highly susceptible varieties. A general shrinkage of the node takes place, accompanied by shrinkage and death of the internodal tissues. Death progresses from the tips of branches downwards. Cold weather hastens the breakdown process, the dead stems being bare and very brittle. Some clones may recover, however, some surviving buds developing into shoots with the onset of warmer weather. Affected unripe fruits bear numerous black spots of varying size, the necrosis extending into the fleshy tissue underneath. External root symptoms show as longitudinal fissures (1 cm. or longer) on the cortex surrounded by black or sepia tissue. The roots may be normal in shape or malformed, in which case the fissures are more numerous in the region of the radial constrictions. Internally yellow, sepia, or greenish-black lesions are formed in the tuberous starch tissues, their frequency depending on the tolerance of individual clones.

It appears that the critical temperature at which lethal effects are produced varies with individual clones. In equatorial regions the altitude at which even mildly diseased plants may succumb owing to low temperatures is tentatively put at between 3,500 and 4,500 ft. Insect transmission apparently does not take place at these altitudes. Even in areas up to about 2,000 ft., where the disease is most prevalent, it is not always easily detectable. This is partly due to a process of natural selection, which has eliminated the more susceptible varieties, and partly to the masking of symptoms during the hot weather.

Field trials carried out in the Tanga Province over a period of ten years demonstrated that the susceptibility of various clones ranged from what appears to be complete field immunity through a series showing varying degrees of susceptibility and tolerance to those which are killed. There appears to be little difference in the yields of healthy and secondarily infected plants, though the quality of diseased roots may be greatly impaired in susceptible clones.

These observations indicate that cassava could be grown at high altitudes free from brown streak infection. Unfortunately mosaic [ibid., 27, p. 63] is a menace in such regions and mosaic-resistant clones must be developed first. Control of both virus diseases is being sought by interspecific hybridization [ibid., 28, p. 6].

Viennot-Bourgin (G.) & Grimaldi (J.). **Les Cercospora parasites des feuilles de Manioc.** [The *Cercospora* species parasitic on Manioc leaves.]—*Rev. Bot. appl.*, 30, 329–330, pp. 138–146, 2 figs., 1950.

From a critical study of the species of *Cercospora* reported as parasitic on cassava leaves the authors agree that two are to be distinguished: *C. henningsii* Allesch. [*R.A.M.*, 26, p. 333], the ascigerous state of which is *Mycosphaerella manihotis* [ibid., 15, p. 427], and *C. caribaea* Chupp & Cif. [ibid., 25, p. 327]. The authors add to the list of synonyms of the former given by Ciferri [loc. cit.] *Helminthosporium hispaniolae* Cif. [ibid., 20, p. 445] and *H. manihotis* Rang. [loc. cit.]. The ascigerous state of *C. caribaea* is probably a *Mycosphaerella*.

Bolhuis (G. G.). **Waarnemingen over de zg. mozaïek-ziekte bij Cassave op Java.** [Observations on the so-called mosaic disease of Cassava in Java.]—*Landbouw*, 21, 10–11, pp. 521–527, 1949. [English summary.]

The symptoms of the cassava disease attributed by H. R. A. Muller at Buitenzorg, Java, to the mosaic virus [*R.A.M.*, 11, p. 152] were seldom observed by the

author in his investigations between 1932 and 1938, but they reappeared in a serious form in certain clones after an abnormally long cold spell during the wet season of 1938–9, suggesting the implication of climatic factors, especially temperature. At the same time a severe attack occurred in a planting 3,000 ft. above sea-level south-east of the town. In the next wet season cuttings of various clones from both plantations were planted at Buitenzorg at an altitude of 800 ft., as well as at the higher elevation to the south-east. Six to eight weeks later, all the plants in the latter situation were extensively affected, normal leaf production in the plants of one clone being inhibited and the stunted growth imparting a resemblance to witches' brooms: only one of the clones made a partial recovery. On the other hand, at Buitenzorg all the plants remained healthy, except for very slight foliar infection on one of the clones, coinciding with a short rainy period: the new growth was quite normal. From neither plantation were any reports of a spread of infection to adjacent plots received.

It may safely be assumed from these observations that the Java disease is not caused by the highly infectious virus of the African cassava mosaic [ibid., 28, pp. 6, 115, 271]. This conclusion is further supported by the following evidence. According to Nichols, cassava mosaic in East Africa [Tanganyika] is transmitted by *Bemisia* sp. [ibid., 26, p. 282, and above, p. 399]. Since this genus of white flies is also indigenous in Java, where it has been reported to act as a vector of the tobacco mosaic virus [ibid., 18, p. 554], it might reasonably be supposed to transmit the cassava disease, which does not, however, appear to be the case. The same author reports that nearly all the clones he imported from Java proved highly susceptible to the true cassava mosaic virus, to which they had not previously been exposed in their original habitat at Buitenzorg. Recovery of diseased plants, moreover, has never been observed in the case of the true mosaic. The author concludes that the Java disease is attributable to the low temperatures prevailing for a brief period during the wet season at Buitenzorg and more or less constantly at the high elevation to the south-east.

Delong (D. M.) & Severin (H. H. P.). **Spittle-insect vectors of Pierce's disease virus. I. Characters, distribution, and food plants.**—*Hilgardia*, 19, 11, pp. 339–356, 4 col. pl., 4 figs., 1950.

Descriptions are given of four vectors of Pierce's disease of vine [lucerne dwarf virus: *R.A.M.*, 26, p. 480; 29, p. 8, and next abstract] occurring in North America, namely, *Aphrophora angulata*, *A. permutata*, *Clastoptera brunnea*, and *Philaenus leucophthalmus* and its six varieties; their distribution and food plants in California are reported.

Severin (H. H. P.). **Spittle-insect vectors of Pierce's disease virus. II. Life history and virus transmission.**—*Hilgardia*, 19, 11, pp. 357–376, 6 pl. (2 col.), 1950.

At the California Agricultural Experiment Station *Aphrophora angulata* fed on infected grape vines and transferred to healthy vine cuttings infected 29 per cent. of the plants. Transmission from diseased vines to healthy lucerne resulted in 4 per cent. infection, from infected lucerne to healthy vine 12 per cent., and from infected lucerne to healthy lucerne 4 per cent. (in one experiment).

Males and females of *A. permutata* fed on diseased vines transmitted the virus to 50 and 48 per cent. of healthy vine seedlings, respectively, on which they were kept during adult life. The insects transmitted the virus from diseased vines to 20 per cent. of healthy lucerne, and from infected lucerne to 60 per cent. of healthy vine cuttings. No transmission was obtained from lucerne to lucerne.

Fifty males and 50 females of *Clastoptera brunnea* fed for one day on diseased vines and transferred singly to healthy vine seedlings induced 12 infections (six for each sex). Ten lots of five adults each and eight lots of ten adults transmitted the

virus to 20 and 37 per cent. of vines, respectively. No transmissions were obtained from vine to lucerne, or from lucerne to vine (with one exception), and in one experiment only 25 adults transmitted the virus from lucerne to lucerne (4 per cent. infection). Natural infectivity did not occur in these three species.

Philaenus leucophthalmus var. *leucophthalmus* proved to be an efficient vector, averaging 65 per cent. infections for both males and females, while the varieties *fabricii*, *pallidus*, *marginellus*, and *impressus* averaged 52, 45, 40, and 15·5 per cent., respectively. In inoculations of 87 vines with all the varieties except *marginellus*, 66 infections were obtained, an incidence of 76 per cent. Of thirty lots of the four varieties tested 90 per cent. produced infections. The virus was not often transmitted from vine to lucerne, or from lucerne to lucerne. Varying numbers of three varieties of the insect fed on infected lucerne induced 77 per cent. infection in the vine. Adults of the varieties *leucophthalmus* and *spumarius* were demonstrated to be naturally infected. Some nymphs also caused infection. The minimum latent period in *P. leucophthalmus* var. *leucophthalmus* varied from 3 to 7 hours, in var. *pallidus* from 2 to 6, in var. *impressus* from 3 to 5, and in var. *spumarius* it was 6 hours. The highest numbers of infections were produced when the adults of var. *leucophthalmus* were kept on infected vines for four hours. Five males of this variety retained the virus for from 29 to 76 days (entire adult life) on vine seedlings.

Dalmasso (G.). **Le Viti americane e la loro resistenza alla Peronospora.** [American Vines and their resistance to *Peronospora*.]—*Ital. agric.*, 86, 4, pp. 220–224, 1949.

The author reviews the outstanding work on the mechanism of resistance to *Plasmopara viticola* in American vines [*R.A.M.*, 27, p. 460], most of which has already been noted in this *Review*.

Quinn (D. G.). **Black spot of the Vine.**—*J. Dep. Agric. Vict.*, 48, 1, pp. 27–28, 1950.

The author discusses the occurrence of black spot [*Elsinoe ampelina*] of vine in Victoria and gives control measures [*R.A.M.*, 23, p. 375]. He advocates the use of a late winter corrosive spray (applied 14 days before bud-burst) under favourable weather conditions.

Coombe (B. G.). **Insect pests and diseases of Grape Vines in South Australia.**—*J. Dep. Agric. S. Aust.*, 53, 7, pp. 279–293, 17 figs., 1950.

A key is given for the diagnosis of the most common pests and diseases of grape vines in South Australia, followed by notes on the history, economic importance, symptoms, dissemination of, and conditions favouring the development of powdery mildew (*Uncinula necator*) [*R.A.M.*, 29, p. 347], black spot or anthracnose (*Elsinoe ampelina*) [ibid., 23, p. 375, and preceding abstract], and downy mildew (*Plasmopara viticola*) [ibid., 26, p. 143; 28, p. 512], and control methods.

McFarlane (A. S.). **Electron microscopy of bacteria and viruses.**—*Brit. med. J.*, *1949*, 4639, pp. 1247–1250, 12 figs., 1949.

Included in the author's Almroth Wright Lecture, delivered at the Wright-Fleming Institute of Microbiology, St. Mary's Hospital, on 7th June, 1949, are references to the application of electron microscopy to several plant viruses.

Wildman (S. G.) & Bonner (J.). **Electrophoretic analysis of normal and diseased cytoplasmic proteins as a means of identifying plant viruses.**—Abs. in *Amer. J. Bot.*, 36, 10, pp. 830–831, 1949.

At the California Institute of Technology normal cytoplasmic proteins were compared with cytoplasm from sugar beet and tobacco leaves infected with [beet] curly top virus, cucumber plants with cucumber mosaic virus, Chinese cabbage

with watercress virus [turnip mosaic virus: *R.A.M.*, 19, p. 509, 27, p. 269], and citrus leaves with psorosis virus, using the electrophoretic method [ibid., 29, p. 59]. New protein components were recognized in the diseased cytoplasm before obvious symptoms of the disease were present, and the method appears to be simple and effective for the identification of viruses. It should be possible to purify the new protein component resulting from virus infection using as a virus characteristic the electrophoretic mobility of the protein, particularly where infection occurs only by grafting or insect transmission.

Review of work on the serological reactions of plant viruses.—*Rep. Rothamst. exp. Sta., Harpenden, 1948*, pp. 120–127, 1949.

Studies carried out at Rothamsted during the past 15 years on the serological reactions of plant viruses are reviewed. Twelve groups, serologically distinct, have been identified: tobacco mosaic, potato X, potato Y, henbane mosaic (*Hyoscyamus* virus 3), tobacco etch, tomato bushy stunt, soy-bean mosaic, broad bean mosaic [pea mottle], sugar beet yellows, and three groups of tobacco necrosis viruses. Attempts to produce antisera against various other viruses were unsuccessful. To secure a positive precipitin reaction with sap requires a virus concentration of at least 1 mg/l. and many viruses appear to occur in a more dilute form than this. Sometimes viruses occur in forms that do not give the precipitin test. The methods applicable to such viruses and quantitative methods of assay are discussed. The results of studies on viruses as somatic and flagellar antigens [*R.A.M.*, 27, p. 536] are given.

Bawden (F. C.) & Kassanis (B.). **Some effects of host nutrition on the susceptibility of plants to infection by certain viruses.**—*Ann. appl. Biol.*, 37, 1, pp. 46–57, 1 pl., 1950.

Experiments at Rothamsted Experiment Station showed that fertilizer treatments which greatly influenced the growth of potted White Burley tobacco and Majestic potato plants had little effect on the number that became infected with potato virus Y [*R.A.M.*, 28, p. 303], when colonized with equal numbers of viruliferous *Myzus persicae*, although the number was slightly decreased by nitrogen (as ammonium sulphate) and increased by phosphorus (as calcium superphosphate).

The number of local lesions produced on leaves of tobacco and *Nicotiana glutinosa* plants after inoculation by rubbing with tomato aucuba mosaic (strain of tobacco mosaic virus) and tobacco mosaic viruses [ibid., 29, p. 247] was increased by additions of both nitrogen and phosphorus, provided that these also increased growth. The main effect of both fertilizers in increasing susceptibility was indirect by increasing plant size, but over certain critical ranges both nutrients also increased the numbers of lesions produced per unit leaf area. Conditions of maximum susceptibility approached closely to those producing optimal growth, and susceptibility was decreased by a deficiency or excess of either element. In some cases the addition of nitrogen reduced susceptibility while still increasing plant growth.

Schmidt (Trude). **Das Auftreten wichtiger Krankheiten und Schädlinge an Kulturpflanzen in Österreich im Jahre 1949.** [The occurrence of important diseases and pests on cultivated plants in Austria in the year 1949.]—*PflSch. Ber., Wien*, 4, 5–6, pp. 84–94, 1 graph, 1949.

Fungal diseases were exceptionally severe and widespread in Austria during 1949 [cf. *R.A.M.*, 28, p. 377]. Apricots, and here and there peaches, were severely infected by *Clasterosporium carpophilum* [ibid., 28, p. 405], resulting in defoliation. The prevalence of the fungus in lower Austria and Burgenland, where it is seldom observed, is no doubt attributable to the extraordinarily heavy precipitation and frequent mists at the critical period. In the Tyrol infection was heavier on cherry.

In the same district apples sustained more or less extensive defoliation through intensive outbreaks of an uncommon rust, *Gymnosporangium tremelloides* [ibid., 17, p. 535]. *G. sabinae*, too, was more abundant than usual on pear. Another noteworthy record is cherry leaf spot (*Septoria cerasi*) in Vienna and in a very virulent form in a Lower Austrian nursery. Mulberry leaves in the same region were attacked by *Mycosphaerella mori* [ibid., 26, p. 335].

Opium poppies were severely attacked by *Peronospora arborescens* [ibid., 25, pp. 418, 579] at Salzburg and in Styria. Lettuce rot caused by *Sclerotinia minor* was favoured by neglect of crop rotation and continuous rain, with disastrous results in some market-gardens where up to 100 per cent. of the crop was lost. Cucumber gummosis (*Cladosporium cucumerinum*) [ibid., 29, p. 346] was destructive in greenhouses. *Coleosporium senecionis* was responsible for the loss of 4,000 cineraria plants [ibid., 28, p. 456].

Mycology and Plant Pathology ; Section of Agricultural Sciences.—Proceedings of the Thirty-Seventh Indian Science Congress, Poona, 1950. Part III. Abstracts, pp. 56–59, 75–92, 1950.

M. J. Thirumalachar states that *Uredinella spinulosa* [*R.A.M.*, 20, p. 575] was found on scale insects in Khandala [Poona district, Bombay], and *Aschersonia papillata* on Aleyrodidae in the Nandi Hills, Mysore. The latter fungus forms hard, flattened stromata up to 2·5 mm. in diameter, with a white margin and orange centre. The pycnidiospores measure 10 to 15 by 1 to 1·5 μ and often appear spuriously uniseptate.

R. N. Tandon and J. P. Srivastava found that *Alternaria tenuis* produced lipase, butyrase (intracellularly only), amylase, invertase, raffinase, maltase, emulsin, cellulase, hemicellulase, pectinase, proteolytic enzymes, erepsin, and urease. Cellulase was produced in the largest amounts. *Curvularia lunata* did not produce butyrase and proteolytic enzymes extracellularly or cellulase intracellularly. *Fusarium caeruleum* did not liberate butyrase or produce amylase, invertase, or emulsin intracellularly.

J. P. Srivastava found that the greatest dry weight of *A. tenuis* grown on Asthana and Hawker's medium [*Ann. Bot., Lond.*, 50, pp. 325–344, 1936] was obtained with hydroxylamine as nitrogen source. The best growth of *C. lunata* occurred on the basal medium, with *d*-glutamic acid and asparagine substituted for potassium nitrate giving analogous results.

J. N. Ral states that a leaf blight of *Citrus acida* var. *variegata*, conspicuous during the rainy season, is caused by a new strain of *Colletotrichum gloeosporioides*, which attacks only this variety of citrus.

R. S. Mathur reports that four isolates of *C. lindemuthianum* all proved partially deficient in one or more of the vitamins thiamine, biotin, inositol, and pyridoxine. They all differed in their vitamin requirements.

S. P. Capoor states that the virus causing distortion mosaic of *Datura alba* (*Curr. Sci.*, 17, p. 151, 1948) is inactivated at 60° C. in ten minutes, has a longevity *in vitro* of 13 days, is not present in high concentrations in the host, has a dilution end point of 1×10^{-4}, and withstands treatment with 95 per cent. ethyl alcohol for over 30 hours at low temperature. The purified virus solution was opalescent and highly birefringent and showed anisotropy of flow visible to the naked eye. The virus, isoelectric at pH 4·5, forms long, rod-shaped paracrystals at pH 5·5 and aggregates into small spindles on further concentration ; true crystals are not formed and it remains in a liquid crystalline state. The purified preparation was mostly free from pigmentation, this being confirmed by the visible spectrum photograph. It gave protein reactions.

M. K. Patel, Y. S. Kulkarni, and G. W. Dhande record an apparently new bacteral leaf spot of *Xanthium strumarium*, observed near Government Farm,

Jalgaon [Bombay], in August, 1948. The pathogen is named *Xanthomonas badri* n.sp.

B. B. Mundkur states that large-scale operations against plant diseases have recently been started in several provinces in India, attention being given only to food crops and to diseases which can be easily or rapidly controlled by approved scientific methods. Commercial and cash crops are not included, though such operations on coffee, tea, and areca nut have been undertaken by the industry.

S. P. Capoor states that pigeon pea sterility [*R.A.M.*, 11, p. 425] was present in about 7 per cent. of the crop in Bombay Province in 1946, while by January, 1947, the disease had affected over 20 per cent. of the plants grown for varietal selection at the Tobacco Breeding Station, Nadiad, North Gujrat. Affected plants are characterized by general pallor, profuse, upright vegetative growth, and an absence of flowering branches. The leaves are usually small and pale often with a well-marked mosaic pattern. The disease was transmitted to 34 of 75 plants grafted with affected scions, symptoms appearing in 35 to 40 days; one of 22 plants inoculated by leaf-rubbing in the glasshouse developed symptoms after 81 days.

M. K. Desai states that the Tyagli and Nilekani strains of *Phytophthora arecae* [ibid., 27, p. 159], which appeared to have lost their ability to form oospores [in pure culture], produced these organs copiously after culturing on host tissue or on French bean [*Phaseolus vulgaris*] agar. A subculture of *Phytophthora* from jak fruit [*Artocarpus* sp.] was similarly induced to form oospores [cf. ibid., 27, p. 451]. A culture of *P. meadii* began to produce oospores sparingly on French bean agar. The evidence appears to show conclusively that inability of *Phytophthora* spp. to form oospores is due to a lack of proper nutriment; when this is supplied the original capacity is restored.

Breeding work by V. P. Gokhale, B. B. Chowdhury, M. K. Patel, and V. M. Chavan since 1941 to obtain wheats resistant to stem rust (*Puccinia graminis tritici*) in Bombay [ibid., 28, pp. 387, 518] has shown that none of the indigenous varieties and only a few of the exotic ones are resistant to all the races known to occur in Peninsular India. The exotic resistant varieties, agronomically unsuited to Bombay, were crossed with two improved strains. Homozygous resistant segregates with desirable agronomic characters have been obtained from the crosses Kenya E. 144 × Niphad 4, Hofed 1 × Niphad 4, and Mondhya 417 5 × Hofed 1.

M. K. Patel and M. N. Kamat state that standard techniques by which reliable and comparable results may be obtained at different times in breeding work for resistance to plant diseases, in particular to *Fusarium* wilts of sunn hemp [*Crotalaria juncea*], cotton, etc. [ibid., 20, p. 232], have been developed by the Plant Pathology Section of the Bombay Department of Agriculture. The method consists mainly in testing and isolating resistant strains under standard conditions of soil temperature and infectivity in pots in a glasshouse and growing and selfing the promising survivors in a highly infested plot. This process is repeated until homozygosity for resistance is attained. The testing of wheat strains for resistance to stem rust is also being carried out at Mahableshwar by a method similar to that evolved in the United States. Several hybrids obtained by crossing Niphad 4 and Mondhya with Kenya E. 144 and Hofed are homozygous for rust resistance and other desirable agronomic characters. A similar method is also being developed for testing rice plants against blast (*Piricularia oryzae*) [ibid., 21, p. 362; 27, pp. 314, 379, 581], recently introduced into Bombay [C.M.I. Map No. 51].

M. K. Patel, Y. S. Kulkarni, and G. W. Dhande state that a bacterial leaf spot, often mistaken for the disease caused by *Pseudopeziza medicaginis*, was observed for the first time in India in a lucerne plot on the Agricultural College Farm, Poona, in 1948. Small, round, watersoaked spots appear, measuring at first 0·5 to 1 mm. in diameter. As they enlarge (1·5 to 2 mm.) some become irregular;

they have pale yellow centres with brown margins. When a number of spots coalesce near the tip or the edges of the leaf local distortion ensues. Undeveloped spots remain as dark brown specks. Small, brown, vertical scars appear on the stem. The causal organism, pathogenic also to *Melilotus indica*, *Trigonella foenum-graecum*, and peas, was identical in all its characters with *X. alfalfae* [ibid., 14, p. 766]. The pathogen was probably introduced on seed imported from abroad.

M. K. Patel and N. D. Diwan describe a destructive bacterial blight of cowpea first observed on the Agricultural College Farm, Poona, in May, 1945. Light yellow, irregular to round spots, measuring 4 to 10 mm. in diameter with necrotic brown centres, appear and increase irregularly until the whole leaf is involved. The dark yellow colour surrounding the central pale brown spot fades off at the periphery; the small veins within and around the spots become reddish-brown and shrivelled. Occasionally infection follows the veins, and the surrounding part turns yellow. Severely affected leaves become straw-coloured and drop at the slightest touch. In very serious cases the leaves dry up without showing any spots. In nature infection occurs through the stomata; on the petioles and stems it takes place only through wounds. On the pods dark green watersoaked spots 1½ to 2 mm. in diameter are present, varying in shape and number. The seeds do not appear to become affected. The organism, except in a few details, resembles *X. vignicola* [ibid., 28, p. 577]. It infests *Vigna catjang*, *V. sinensis*, *V. sesquipedalis*, and several varieties of *Phaseolus vulgaris*. In this instance also, the pathogen appears to have been imported from abroad.

M. K. Patel, Y. S. Kulkarni, and G. W. Dhande state that bacterial leaf spot of chilli (*Capsicum frutescens*) due to *X. vesicatoria* [ibid., 28, p. 436] was observed for the first time in India at the Agricultural College Farm, Poona, in August, 1948.

P. M. Varma, S. P. Capoor, and M. K. Patel state that bhendi (*Hibiscus esculentus*) is seriously affected in Bombay by yellow vein mosaic [ibid., 20, p. 242]. The disease can be effectively controlled by destroying all plants in April and May, growing no bhendi in June and July, and roguing the newly sown crop at weekly intervals, destroying all diseased plants. Roguing at regular intervals kept incidence down to 4 per cent. or less, though in unrogued plots it reached 73 per cent. in two and a half months.

Progress Report 1938-1947. Division of Illustration Stations, Central Experimental Farm, Ottawa.—85 pp., 26 figs., 3 graphs, 1950.

The results of 433 tests conducted on several soil types in five eastern Provinces of Canada and in British Columbia on the control of brown heart of swedes [boron deficiency: *R.A.M.*, 29, p. 142] showed that applications of 20 lb. borax per acre before sowing resulted in an average of 89·9 per cent. healthy plants. Only five stations in Quebec and one in New Brunswick had over 20 per cent. of the treated crop affected; one station at St. Evariste, Quebec, had over 90 per cent. in spite of borax applications. In similar cases foliage spraying is recommended.

The beneficial effect of organized fungicidal spraying of potato [against diseases including blight (*Phytophthora infestans*)] was demonstrated at Fort William, Ontario, where the sprayed plots yielded 329·4 bush. per acre (average for four years) and the unsprayed 222·9 bush., the percentage of marketable tubers being 91·1 and 77·1 per cent., respectively.

In experiments carried out from 1944 to 1947 on the control of downy mildew of hops [*Pseudoperonospora humuli*: ibid., 29, p. 83], which became serious in the Fournier area in 1943, spraying with 10-10-100 Bordeaux mixture and C.O.C.S. [copper oxychloride sulphate] plus spreader-adhesive gave good control. The applications in this district should start about the middle of June and be repeated at 10-day intervals until flowering. If powdery mildew [*Erysiphe cichoracearum*] is prevalent subsequent sulphur dusting may be necessary. The spraying schedule

must be accompanied by good cultural practices, such as early tying and destruction of crop debris after harvest.

LEFEBVRE (C. L.). **Observations on plant diseases in Alaska.**—*Plant Dis. Reptr*, 34, 1, pp. 3–4, 1950. [Multilithed.]

A plant disease survey of the agricultural areas of Alaska in 1948 revealed that in the Fairbanks area the most prevalent potato disease early in the season appeared to be black leg (*Erwinia phytophthora*). Traces of mild mosaic [potato virus X] and rugose mosaic virus [potato virus Y] were found in every field, and *Pellicularia filamentosa* [*Corticium solani*] was ubiquitous, though in no field did over 5 per cent. of the plants show cankers. The *Verticillium* wilt fungus [*V. albo-atrum*: *R.A.M.*, 27, p. 119] was isolated from certified Teton potatoes. Ring rot (*Corynebacterium sepedonicum*) [ibid., 27, p. 492] was first observed by growers in the Fairbanks area in 1945, and appears to be an important and destructive disease of potatoes in Alaska.

Other records in the Fairbanks area were *Streptomyces* [*Actinomyces*] *scabies* [ibid., 28, pp. 514, 539] on radishes, *Cladosporium* [*fulvum*] on greenhouse tomatoes, *Helminthosporium* [*Pyrenophora*] *avenae* and *Ustilago avenae* on oats, *Selenophoma bromigena* [ibid., 26, pp. 493, 545] and *H. bromi* [ibid., 24, p. 317] on *Bromus inermis*, and *Ascochyta imperfecta* [ibid., 28, pp. 18, 577] and *Pseudopeziza medicaginis* [loc. cit.] on lucerne.

Potato scab (*A. scabies*) and potato witches' broom virus (trace) were present in the Matanuska Valley, and oat smut (*Ustilago* spp.) was found in all fields examined. In the Homer area 10 per cent. of the blue joint grass (*Calamagrostis canadensis*) on one ranch was considerably dwarfed by *Ustilago striiformis* [ibid., 28, p. 133].

Plant diseases.—*Agric. Gaz. N.S.W.*, 61, 2, pp. 77–81, 4 figs., 1950.

The recommendations for the control of whiptail of cauliflower (molybdenum deficiency) have been noticed from another source [*R.A.M.*, 28, p. 370, and above, p. 396].

In New South Wales the most important disease of celery is late blight or leaf spot caused by *Septoria apii-graveolentis* [ibid., 27, p. 59]. New seed should be treated in hot water before sowing, either for 10 minutes at 135° F. or for 30 at 118° [ibid., 25, p. 250], the latter treatment being somewhat superior in effect. Good control can also be obtained by spraying the seed-bed and later the transplanted seedlings with 1–1–10 Bordeaux mixture at intervals of one or two weeks. Sterilized soil or that which has not previously grown celery should be used for the seed-beds. All infected leaves and stalks should be destroyed and crop rotation introduced.

In the summer of 1949 *Septoria* spot of oranges [*S. depressa*: ibid., 28, p. 571] was severe in the Murrumbidgee Irrigation Area owing to a fortnight of almost continuous wet weather. This commenced at the end of February, but rind spots did not develop until late in the winter, following a period of heavy frosts. It appears that there are two phases in the development of the disease, namely the infection period, which may start at the end of February and extend till May, and the period of lesion formation. To safeguard against early infection a summer spray is advised, but another spray is probably necessary to protect the fruit during the whole of the danger period.

New plant disease records include *Phytophthora cinnamomi* on pineapple, found on the North Coast.

LEYENDECKER (P. J.). **1949 plant disease survey for New Mexico.**—*Plant Dis. Reptr*, 34, 2, pp. 39–40, 1 fig., 1950. [Multilithed.]

During 1949 *Macrophomina phaseoli* [*R.A.M.*, 11, p. 171; 27, p. 551] was responsible for foot rot and stem blight of Pinto beans [*Phaseolus vulgaris*] in New

Mexico. Seedling as well as stem blight was severe at Tucumcari, where the Pinto bean is the principal cash crop. A leaf spot of onion caused by *Phyllosticta allii* [ibid., 5, p. 251; 7, p. 428] was reported for the first time from New Mexico, approximately 80 acres of the Yellow Granos variety being seriously affected. The outbreak, induced by ten days' high humidity, was checked by the return of arid conditions. An unusual amount of neck bulb rot of White Grano onion was caused by *Rhizopus stolonifer*; infection occurred at harvest time and affected 5 to 10 per cent. of the bulbs.

Bacterial blight of cotton (*Xanthomonas malvacearum*) [ibid., 18, p. 520; 28, pp. 572, 573; 29, pp. 153, 211], which causes slight reductions of yield every year in New Mexico, approached an epiphytotic stage in the Pecos valley in 1949, affecting 40,000 acres. The reduction in yield was estimated at 35 to 50 per cent.

Chilli pepper (*Capsicum frutescens*) was very severely affected by [beet] curly top [virus] [ibid., 14, p. 339], 50 to 60 per cent. of the plants in large commercial plantings being attacked. Many growers rogued late, but incidence remained high. The disease was also more prevalent on tomatoes [ibid., 27, pp. 118, 224] than in previous years. An apparently undescribed virus disease of chilli occurred at the New Mexico A. & M. Horticultural Farm on two plants in breeding plots in 1948 and on scattered plants in many rows in 1949. There was a slight mottling and thickening of the leaves and an unusual enlargement of the calyx with resultant sterility of the flower. A similar condition affected tomatoes in a field two miles away.

Noronha (E. de A.). **Notas fitopatológicas (de Agosto de 1948 a Maio de 1949).** [Phytopathological notes (from August, 1948, to May, 1949).]—*Agron. angol., 1949*, 2, pp. 37–44, 1949. [French and English summaries.]

Nearly all the fungi listed, with brief notes, in this report from Angola (Portuguese West Africa) were collected on the plateau of Benguela. They include plum and peach rust (*Puccinia pruni-spinosae*); vine downy mildew (*Plasmopara viticola*); groundnut leaf spot (*Cercospora arachidicola*) and rosette virus; cassava mosaic virus; foot rot (*Helminthosporium sativum*) and loose smut (*Ustilago tritici*) of wheat; maize rust (*Puccinia maydis* [*P. sorghi*]), leaf blight (*H. turcicum*), and streak virus; sorghum smut (*Sphacelotheca sorghi*); sunflower rust (*P. helianthi*); lucerne rust (*Uromyces striatus*); castor oil (*Ricinus communis*) rust (*Melampsora* [*Melampsorella*] *ricini*); *Dahlia* smut (*Entyloma dahliae*); and *Mycosphaerella fragariae* on strawberry.

Atkinson (Elsie), Melvin (S.), & Fox (S. W.). **Some properties of 2, 3, 5-triphenyltetrazolium chloride and several iodo derivatives.**—*Science*, **111**, 2885, pp. 385–387, 1 fig., 1950.

In experiments carried out in the Chemistry Laboratory, Iowa State College, an observation of the partially selective staining action of 'tetrazole' (2,3,5-triphenyltetrazolium chloride) led to its consideration as a neoplasm indicator. Stained sections of sunflower stalk and tumour (induced by *Phytomonas* [*Bacterium*] *tumefaciens*) indicated virtually complete visual specificity in reaction after 1 hour, while after 4 hours the appearance of formazan is definitely discernible in normal tissue. In several experiments more rapid and intense staining was observed by iodo tetrazoliums than by the parent compound.

Duhamet (L.). **Action du lait de Coco sur la croissance des tissus de crown-gall de Scorsonère cultivés in vitro.** [Action of Coco-nut milk on the growth of *Scorzonera* crown gall tissues cultured *in vitro*.]—*C. R. Acad. Sci., Paris*, 230, 8, pp. 770–771, 1 graph, 1950.

The addition of 50 per cent. coco-nut milk to cultures of crown gall [*Bacterium tumefaciens*] fragments from *Scorzonera* on sterilized synthetic media resulted in an

acceleration of the growth rate amounting to nearly 2½ times that of the controls. The lower limit for the action of the milk appeared to lie around 0·1 per cent. Evidently the excitant-formative principle in the coco-nut milk has no connexion with indole-acetic acid or related auxins, which exert no comparable influence on *Scorzonera* crown gall. This is stated to be the first record of a substance with an indisputable aptitude for stimulating the proliferation of tumour tissue.

Posnette (A. F.). **Virus diseases of Cacao. Proceedings of the Association of Applied Biologists.**—*Ann. appl. Biol.*, 37, 1, p. 131, 1950.

This paper on swollen shoot disease of cacao [*R.A.M.*, 29, p. 205] deals with the origin of the disease, its spread from wild plants (*Cola chlamydantha* being in particular an important source of infection in the Gold Coast), cacao resistance, and the relationship between the virus and its vector.

Lansade [M.], Ponchet (J.), & Guntz (M.). **Essais et contrôle de produits contre la carie du Blé en 1949.** [Tests with and control of products against Wheat bunt in 1949.]—*C. R. Acad. Agric. Fr.*, 36, 2, pp. 73–75, 1950.

In further laboratory and field tests carried out at Versailles in 1948 and 1949 with various products against wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, 28, p. 519] the best results were given by pentachloronitrobenzene [loc. cit.] and copper 8-quinolinolate [ibid., 28, p. 182]. The latter was at least as effective as cupric chloride, while the former gave adequate control at a concentration as low as 12 per cent. of the pure product.

Aufhammer (G.). **Ein Beitrag zur Flugbrand-Bekämpfung des Weizens.** [A contribution to the control of Wheat loose smut.]—*Prakt. Bl. PflBau*, 21, 4, pp. 137–147, 1943–44. [Received 1949.]

The diffusion of wheat varieties susceptible to loose smut [*Ustilago tritici*] has been accompanied by a spread of the disease in some parts of Germany [*R.A.M.*, 21, p. 411]. Effective control was obtained at the Plant Breeding Institute, Weihenstephan, Bavaria, by immersion of the seed-grain in a continuous hot water bath for 2 to 2½ hours at 47° C., with the addition of germisan or ceresan at 0·03 to 0·1 per cent. A similar modification of the hot-water treatment has been successfully applied to the control of barley loose smut [*U. nuda*: ibid., 23, p. 11].

Winter (A. G.) & Rümker (Rosmarie v.). **Die Bedeutung der Mikroflora der wurzelnahen Zone für die Resistenz von Wurzeln gegen Pilzkrankheiten.** [The importance of the microflora of the rhizosphere in the resistance of roots to fungal diseases.]—*Naturwissenschaften*, 36, 1, pp. 30–31, 1949.

At the Phytopathological Institute, Bonn, *Ascochyta pinodella* and *Fusarium culmorum*, actively parasitic on peas, did not infect wheat and maize in natural soils: in fact, the growth of the latter crop was promoted by the presence of *F. culmorum*. However, pure cultures of the fungi on sand or agar moistened with Zinzadze's solution were pathogenic to both cereals. *A. pinodella* enveloped the surface of the wheat roots in a dense, dark-coloured hyphal mantle, penetrating the cortical layer and clearly inhibiting later root production. The picture presented was reminiscent of a pseudo-mycorrhiza, in which the morphological characters of the true mycorrhiza are not fully developed and the symbiotic equilibrium is shifted to the detriment of the host, i.e., the fungus pursues a definitely parasitic course of action. Under the same sterile conditions the infection of maize by *A. pinodella* was milder, the hyphal mantle being absent and penetration into the outer cell layers quite localized. On the other hand, pure cultures of *F. culmorum* brought the growth of maize and wheat roots to a standstill after discolouring and permeating the entire tissue. This effect, however, is the outcome of two

components, a toxic action of the metabolic products of the fungus and direct parasitization, the former playing the principal part in the case of wheat while both processes are important in that of maize. It is concluded that the resistance of maize and wheat to the two fungi under observation is largely conditioned by the rhizosphere microflora [cf. *R.A.M.*, 22, p. 78 *et passim*]. On colza *A. pinodella* forms an exceptionally dense hyphal mantle without penetrating the root cortex, whereas vetch roots are extensively parasitized without any exterior symptoms.

It seems possible to make practical application of this peculiarity of the rhizosphere. For example, the early development of maize is definitely expedited in natural soil by the insertion below the seed of agar fragments permeated by *F. culmorum*, which evidently envelopes the seed and roots in mycelium and so protects it from the attacks of damping-off fungi. An approach to the mycorrhiza problem along the lines of the authors' experiments, using rapidly growing plants like wheat, might well prove fruitful.

Göksel (N.). **Türkiyede Arpa rastığının yeni amili Ustilago nigra.** [Barley smut caused by *Ustilago nigra* in Turkey.]—*Zir. Derg.*, 99, pp. 8–12, 1 fig., 1950. [English summary.]

Of 77 smutted barley samples from various localities in Turkey, 57 were infected with *Ustilago nigra*, while the rest yielded *U. nuda* [*R.A.M.*, 27, p. 115]. To control the disease chemical seed-dressing is recommended.

Atkins (I. M.). **Diseases of small grain in Texas in 1949.**—*Plant Dis. Reptr*, 34, 2, pp. 40–42, 1950. [Multilithed.]

In this report data are given on the exceptionally heavy losses to small grains in Texas in 1949. For instance, among wheat diseases *Puccinia rubigo-vera* var. *tritici* [*P. triticina*] caused 11·1 per cent. loss of yield, or 12,436,350 bush., stem rust (*P. graminis*) 4·8 per cent. loss (5,845,100 bush.), *Septoria* diseases (*S. tritici* and *S. nodorum*) 3·4 per cent. (4,217,550 bush.), and loose smut (*Ustilago tritici*) 0·15 per cent. (179,310 bush.).

P. triticina was largely present on Austin wheat, highly resistant until recently. Counts on slides exposed for the Rust Prevention Service reached a maximum of 3,120,000 spores per sq. ft. on 18th April at Temple, Texas, and of 2,845,000 spores per sq. ft. on 5th April at Chillicothe. Westwar wheat remained fairly resistant.

P. coronata and *P. graminis* var. *avenae* reached epidemic proportions on oats before the crop matured. Damage, however, was not proportional to the amount of infection observed and many Red Rustproof strains and Bond derivatives with infection readings of nearly 100 per cent. gave good yields with only moderate damage to quality.

Josephson (L. M.) & Reid (D. A.). **Small grain diseases in Kentucky in 1949.**—*Plant Dis. Reptr*, 34, 1, pp. 24–26, 1950. [Multilithed.]

During 1949 barley scald (*Rhynchosporium secalis*) [*R.A.M.*, 24, p. 55; 29, p. 360] was prevalent over most of Kentucky, but most severe in the south-west. Wheat leaf spot (*Septoria tritici*) [ibid., 25, p. 301; 26, p. 539] attacked all varieties in plots and nursery in Todd County. Anthracnose (*Colletotrichum graminicola*) [ibid., 25, p. 543; 27, p. 526] was very severe in the autumn-sown nursery in Todd County on Sturdy and Anderson 1 oats, and caused 30 per cent. breakage in Balbo rye in the Todd County test field.

Rosen (H. R.). **Oat diseases in Arkansas 1948–49.**—*Plant Dis. Reptr*, 34, 2, pp. 43–44, 1950. [Multilithed.]

During 1949 by far the most common and probably the most damaging disease of oats in Arkansas was anthracnose (*Colletotrichum graminicola*) [*R.A.M.*, 20, p. 395; and preceding and next abstracts], this being the fourth successive year in which

the disease was widely prevalent; even Red Rustproof strains, on which the lesions are usually smaller than in the commonly grown Victoria derivatives, appeared to have more infection than in the past. In certain fields nearly all the leaf area was killed when the plants were in the milk stage, the loss of yield probably reaching at least 20 per cent.

Leaf spot (*Pyrenophora avenae*) [ibid., 28, pp. 14, 214, 520] was as abundant as in previous years. The evidence indicated that infection appeared first on volunteer oats in the seedling stage and spread to neighbouring cultivated fields in the autumn of 1948. Even fields sown with seed treated with an organic mercury compound developed considerable leaf spot in the autumn of 1948.

As in 1948 there was an average of approximately 5 per cent. smut (*Ustilago* spp.) in the State as a whole. Traveler, De Soto, and several other Victoria derivatives showed more smut than ever before, indicating the spread of relatively new races, mostly of the loose smut (*U. avenae*) type [cf. ibid., 27, p. 180].

LUTTRELL (E. S.). **Grain Sorghum diseases in Georgia—1949.**—*Plant Dis. Reptr*, 34, 2, pp. 45–52, 1950. [Multilithed.]

During the early part of the summer of 1949 the most important grain sorghum disease in Georgia was bacterial stripe (*Pseudomonas andropogoni*) [*R.A.M.*, 15, p. 346; 26, p. 494], though Hegari and Early Hegari alone appeared to be highly susceptible. In the latter part of the summer zonate leaf spot (*Gloeocercospora sorghi*) [ibid., 27, p. 158] was the most common disease on all varieties though different degrees of infection were shown in different localities. Texas Milo appeared to be the most resistant.

Grey leaf spot (*Cercospora sorghi*) [ibid., 18, p. 517; 24, pp. 14, 388] was present on all varieties planted, but important only on kafir varieties, Imperial kafir and Imperial kafir No. 360 being the most severely infected; Martin's Combine milo appeared to be the most resistant variety. Texas milo was everywhere resistant to anthracnose (*Colletotrichum graminicola*) [ibid., 22, p. 475]. Rust (*Puccinia purpurea*) [ibid., 18, p. 374] was present in the late summer and autumn on nearly all varieties; kafir varieties appeared to be the most susceptible, Texas milo the most resistant.

Early planting at Sandersville, Experiment, and Rome appeared to be responsible for severe head mould, farmers' fields planted later in the same localities not being seriously affected. The disease may be expected to present a problem wherever conditions favour it immediately before harvest, regardless of planting date. At Rome, the varieties Hegari, Early Hegari, Imperial kafir, Imperial kafir No. 360, and Martin's Combine milo were highly resistant as compared with other varieties. The fungi associated with head mould were, in decreasing order of abundance, *Corethropsis* sp. [cf. ibid., 17, p. 39], *Fusarium* spp. (mainly *F. moniliforme* [*Gibberella fujikuroi*: ibid., 23, p. 102]), *Curvularia* sp., *G. zeae* [ibid., 24, p. 365], *Colletotrichum graminicola*, and *Penicillium* spp.

Stalk rots were the most serious diseases in the test at Rome; Imperial kafir, Imperial kafir No. 360, and Hegari seemed highly resistant, and Double Dwarf milo No. 38 was the most resistant of the combine types. A complex of stalk rots was present at Rome, though most of the isolates proved to be *Fusarium* spp. The different types of rot were tentatively determined from the symptoms as anthracnose stalk rot (*C. graminicola*), charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*: ibid., 29, p. 207], *Rhizoctonia* rot (*R.* [*Corticium*] *solani*) [ibid., 27, p. 187], and southern sclerotial rot (*Sclerotium rolfsii*) [ibid., 27, p. 555; 28, p. 641].

MCCLEAN (A. P. D.). **Possible identity of three Citrus diseases.**—*Nature, Lond.*, 165, 4202, pp. 767–768, 1 fig., 1950.

The author draws attention to the close similarity between three citrus diseases,

namely, xyloporosis [*R.A.M.*, 14, p. 162; 18, p. 101], the cause of which has not been satisfactorily explained, stem pitting [ibid., 29, p. 289], and a virus disease of lime seedlings [loc. cit.], all of which exhibit the primary symptom of wood-pitting.

It has now been established that stem pitting of grapefruit in South Africa is of virus origin. Bailedge Early orange, West Indian lime, citron, shaddock, and sweet lime (when used as a stock) also show symptoms. The virus was transmitted from diseased to healthy grapefruit seedlings by budding, tissue grafts, and by using as vector *Aphis citricidus*, which is abundant in citrus orchards. The virus has been recovered from Bailedge Early orange, Sampson tangelo, Natal tight skin naartjie [mandarin], and from apparently healthy Valencia orange and Lisbon lemon. The virus appears to be present almost universally in South African commercial citrus plantings, though sweet oranges on rough lemon suffer no evident damage. The West Indian lime has proved an excellent indicator plant, and the symptoms produced one or two months after inoculation appear to be identical with those on lime seedlings in the Gold Coast [loc. cit.]. The reaction of the test plant confirmed the existence of two strains of the virus. Further evidence suggesting the identity of the viruses is the disappointing outcome of using sweet lime rootstocks in South Africa, because of the dwarfing of the scion. All stocks inspected showed wood-pitting probably identical with xyloporosis. From two dwarfed scions, a Valencia orange and a Lisbon lemon, an infection has been obtained apparently identical with the virus of stem-pitted grapefruit.

If xyloporosis is the same as stem-pitting, which is almost certainly identical with the disease of lime, the causal virus of the three diseases should be called the *Citrus* xyloporosis virus.

Drouillon (R.). **A propos du Pestalozzia versicolor Speg.** [On *Pestalotia versicolor* Speg.]—*Rev. Mycologie, Suppl. colon.*, 14, 2, pp. 74–88, 4 figs., 1949.

Pestalotia versicolor [*R.A.M.*, 28, p. 489] was isolated from the necrotic vessels of oil palm rachides in French Middle Congo in January, 1948, and from the soil of an oil palm near Okelantaka. A detailed study of the fungus isolated from soil is presented (with a table giving the measurements of 15 other species, varieties, and strains of *Pestalotia* with which it was compared); it was identical in its morphological and cultural characters with a *Pestalotia* found on cacao in the Ivory Coast. It was also found in association with *P. palmarum* on leaflets of oil palm from the Ivory Coast.

Heim (R.). **Introduction à l'étude du boyomi.** [An introduction to the study of boyomi.]—*Rev. Mycologie, Suppl. colon.*, 14, 2, pp. 41–49, 1 pl., 1 fig., 1949.

Further investigations into boyomi disease of oil palms in the French Congo showed that *Fusarium bulbigenum* var. *tracheiphilum*, *F. vasinfectum*, and *F. oxysporum* [*R.A.M.*, 29, p. 362] are present concurrently either in the affected trees or in the soil in which they are growing. The first two were also isolated from the rachides, where *F. bulbigenum* var. *tracheiphilum* was the more common, though it was not present in affected roots or trunks. The evidence appears to confirm the author's view that necrosis of the rachides is due to *F. bulbigenum* var. *tracheiphilum*. Further work is to be undertaken.

Subramanian (C. V.). **Soil conditions and wilt diseases in plants with special reference to Fusarium vasinfectum on Cotton.**—*Proc. Indian Acad. Sci.*, Sect. B, 31, 2, pp. 67–102, 2 pl., 9 graphs, 1950.

Further investigations at the University Botanical Laboratory, Madras, on the behaviour in the soil of two strains of *Fusarium vasinfectum*, the agent of cotton wilt [*R.A.M.*, 26, p. 106], showed that the fungus was more tolerant of adverse physical conditions than of those favouring general microbiological activity. Dis-

appearance was hastened by soil moisture levels ranging from 30 to 90 per cent. of the water-holding capacity, and was at a minimum in air-dry soil, was greater at 30 per cent., and reached a maximum at 90. Decomposition was also hastened by temperatures of 28° to 30° C., by forced aeration, and the addition of stable manure. Persistence continued undiminished under sterile conditions for more than 24 months.

Fusarium spp. were the primary and dominant colonizers of various plant parts buried in moist 'wilt-sick' soils from Udamalpet, India, either in the laboratory or under a cotton crop in the field, and they invariably remained for 16 weeks as dominant colonizers on root bits. Colonization of cotton roots was partially or completely inhibited by dryness, waterlogging, low temperatures, and organic manuring, but under all other conditions colonization took place; it was favoured by the addition of lime. *Fusarium* spp. were able to colonize cotton root pieces irrespective of their size or of the microflora already present. Colonization in soils under different crops was not appreciably affected by the nature of the crop. *Fusarium* spp. extended to a depth of 36 in. in soil. The sequence of fungal succession on root pieces was *Fusarium* spp., *Aspergillus niger*, *A. nidulans* (group), and *A. fumigatus* (group). Investigation of the effect of soil amendments on colonization by *Fusarium* spp. and the fungal succession on cotton roots showed that ammonium sulphate, sodium nitrate, soluble starch, phosphate, potassium sulphate, potassium carbonate, and lime (all at 2 per cent. on a weight basis) enhanced colonization; stable manure depressed it.

Capoor (S. P.). **A mosaic disease of Sunn Hemp in Bombay.**—*Curr. Sci.*, 19, 1, p. 22, 1950.

A mosaic disease of sunn hemp (*Crotalaria juncea*), observed at the Agricultural College Farm, Poona, in November, 1940, closely resembles that already described from Delhi [*R.A.M.*, 26, p. 300] in symptomatology, but is altogether different in its physical properties and host range. It is accordingly designated 'southern sunn hemp mosaic' to distinguish it from the virus on the same host in northern India. The principal features of the disease are foliar stunting, slight malformation, and puckering in the form of raised, blister-like, green areas alternating with pale green ones. Thin, elongated enations are occasionally formed on the ventral sides of the leaves. The affected plants are dwarfed and produce little seed.

The virus is readily transmitted by the leaf-rubbing method with infective juice. It retains its toxicity at a dilution of 1 by 10^{-5}, survives 10 minutes' exposure to a temperature of 90° C., and in the crude form withstands 557 days' storage. It also proved resistant to 24 hours' contact with 90 per cent. ethyl alcohol. Positive results were obtained in inoculation experiments on six species of *Crotalaria* besides sunn hemp, *Lathyrus sativus*, bean (*Phaseolus vulgaris*), *P. lunatus*, *Vigna unguiculata*, and *V. sesquipedalis*; only local lesions developed on *Nicotiana glutinosa*, *N. sylvestris*, *Datura stramonium*, and chilli (*Capsicum frutescens*).

Andrén (F.). **Betningsförsök med Lin och Hampa 1948.** [Flax and Hemp disinfection experiments 1948.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1949*, 4, pp. 14–15, 1949.

In further flax and hemp seed disinfection experiments at the Plant Protection Institute, Stockholm, in 1948 [*R.A.M.*, 27, p. 421], the former responded most favourably to a new preparation, special-panogén (600 ml. per 100 kg.), which increased the stand by 32·9 per cent., and the latter to panogén (22·3). The average increases in stand resulting from seed treatment were 9·2 per cent. for flax and 6·5 per cent. for hemp. The latter figure is scarcely adequate, but better results are

obtainable by raising the dosage of the chemicals from the ordinary rate of 2 gm. to 3 or 4 gm. per kg. seed.

Hubert (F. P.) & Wheeler (W. H.). **Disease survey of domestic bulbs 1948–49.**—*Plant Dis. Reptr*, 34, 2, pp. 53–55, 1950. [Multilithed.]

During the autumn of 1948 and the spring of 1949 the United States Bureau of Entomology and Plant Quarantine made a survey of the distribution and degree of disease in domestic-grown bulbs or corms of lily, tulip, *Narcissus*, *Gladiolus*, and *Iris* in inter-State shipments. The results showed that important pathogens were generally lacking or present in relatively small amounts. The collection of *Curvularia lunata* [cf. *R.A.M.*, 28, p. 291] on *Gladiolus* corms grown in Virginia was the first record of the fungus on this host from the State. A *Colletotrichum* intercepted on lily bulbs from Oregon and Washington is believed to be *C. lilii* [ibid., 27, p. 186], apparently not before recorded from these two States. The organisms identified are listed under their respective hosts, the State of origin and number of times each fungus was intercepted being indicated.

Butterfield (H. M.). **Growing Begonias in California.**—*Circ. Calif. agric. Ext. Serv.* 162, 41 pp., 33 figs., 1950.

In the section on diseases (pp. 10–12) in this bulletin it is recorded that occasionally begonia seedlings in California are seriously attacked by black root rot (*Thielaviopsis basicola*) [*R.A.M.*, 16, p. 319] and damping-off (species of *Rhizoctonia* and *Pythium*). To control these diseases soil treatment with chloropicrin is advised (0·5 ml. per gal. screened soil). After treatment the soil should stand outdoors for from four days to a week, and then be aired in the greenhouse for one to two weeks. Plants in poorly drained soils suffer from root rots caused by species of *Phytophthora* [cf. ibid., 12, p. 448] or *Pythium*. *Pythium* has been reported on a red-flowered variety of *Begonia semperflorens*, while a pink one growing in the vicinity was not affected. Stem rot caused by either *P. intermedium* or *P. ultimum* [ibid., 21, p. 526] affects plants of all ages, and is especially serious in wet soils and a warm, moist atmosphere. *B. lloydii* is susceptible to both species. Blight (*Botrytis cinerea*) [ibid., 29, p. 365] causes at times serious losses of tuberous begonias. Good ventilation and less humidity round the new plants should help to prevent the trouble. A weak Bordeaux mixture or ammoniacal copper carbonate sprays may aid in control. The tuberous varieties *B. tuberhybrida*, *B. lloydii*, and *B. gracilis* var. *luminosa* in lath houses at Capitola, Colma, and San Francisco were affected by a leaf spot caused by *Xanthomonas begoniae* [ibid., 22, p. 312]. Varieties of the fibrous begonia *B. semperflorens*, including Christmas Cheer, Fire Dwarf, Prima Donna, Roasbelle, Salmon Queen, and Vernon, were highly susceptible; *B. erfordii*, *B. scharffi* (*haageana*), and *B. schmidtiana* were also infected. Overhead watering should be reduced and irrigation confined to the soil about the plants. There is no effective control measure against [tomato] spotted wilt virus. All diseased host plants should be destroyed to prevent the thrips vectors from becoming infective.

Butterfield (H. M.). **Camellia culture in California.**—*Circ. Calif. agric. Ext. Serv.* 164, 23 pp., 1 pl., 14 figs., 1950.

The section (pp. 18–19) of this popular circular dealing with diseases of *Camellia* (*C. japonica*, *C. reticulata*, and *C. sasanqua*) in California includes the description and control of blight (*Sclerotinia camelliae*) [*R.A.M.*, 19, p. 350; 25, p. 561], a yellowing of leaves of undetermined etiology, and bud drop and flower decline. Scar tissue (or scab) appears as small, rounded or oval raised areas on the lower leaf surfaces. Since no organisms were isolated it is attributed to unfavourable environmental conditions or injurious sprays.

Davis (Lily H.), Sciaroni (R. H.), & Pritchard (F.). **Alternaria leafspot of garden Stock in California.**—*Plant Dis. Reptr*, 33, 11, pp. 432–433, 1949. [Mimeographed.]

In late June, 1946, commercial fields of *Matthiola incana* grown for sale as cut flowers in San Mateo County, California, developed leaf spot due to *Alternaria raphani* [*R.A.M.*, 28, p. 159]. The disease was not particularly damaging at the time, but severe losses were reported later in the season and in the following year. It was again observed in October, 1948, and has since destroyed several small plantings. This appears to be the first record of the fungus on *Matthiola* in the United States. It does not occur in the Californian seed-fields, which produce much of the stock seed of the world. Good commercial control was obtained by applications of a dilute copper spray at intervals of ten days.

Brierley (P.). **Eradicant fungicides of possible value against the Azalea petal blight fungus, Ovulinia azaleae.**—*Phytopathology*, 40, 2, pp. 153–155, 1950.

The data obtained in experimental plots at Charleston, South Carolina, in 1940–1 indicate that the production of apothecia of the azalea [*Rhododendron*] petal blight disease fungus, *Ovulinia azaleae* [*R.A.M.*, 28, p. 456], may be inhibited, at any rate for one season, by the application to the soil of granular or powdered calcium cyanamide at 200 to 800 lb. per acre, or of a 1 per cent. elgetol solution at 450 to 1,800 gals. Both materials were injurious to the leaves, but cyanamide was safe if confined to the soil. The treatments were applied on 27th February or 12th March.

Bud blast on Rhododendrons and Azaleas.—*J.R. hort. Soc.*, 75, 6, pp. 230–232, 1 pl., 1950.

In the last few years and particularly during 1949 and 1950, bud blight of *Rhododendron*, caused by *Sporocybe* [*Pycnostysanus*] *azaleae* [*R.A.M.*, 18, p. 683], has spread considerably in south-eastern England. A summary is given of the measures used in the United States for the control of *P. azaleae* on deciduous azalea [loc. cit.]. In England, where the fungus attacks most commonly evergreen *R.* spp., spraying with 2–2 ·50 Bordeaux mixture is recommended.

Green (D. E.) & Hewlett (M. Ann). **A leaf spot disease of Cineraria (Senecio cruentus) new to Great Britain.**—*J. R. hort. Soc.*, 75, 5, pp. 199–202, 1 pl., 2 figs., 1950.

This is a full account of a study on a leaf spot disease of cineraria (*Alternaria senecionis*) reported from four areas in Kent and one in Eire, a shorter version of which has already been noticed [*R.A.M.*, 29, p. 155].

Saaltink (G. J.). **Enkele ziekten en beschadigingen van Lupinen.** [Some diseases and injuries of Lupins.]—*Maandbl. LandbVoorl.*, 7, 4, pp. 152–157, 5 figs., 1950.

Observations on the following diseases of lupins in Holland are summarized: lupin mosaic virus [*R.A.M.*, 28, p. 620], cucumber mosaic virus, wilt (*Fusarium oxysporum* f. [*radicis-*] *lupini*) [ibid., 24, pp. 20, 271], another form of wilt caused by *Verticillium dahliae* [ibid., 4, p. 495; 16, p. 361], damping-off (*Rhizoctonia* [*Corticium*] *solani*) [ibid., 24, p. 22], and mildew (*Erysiphe polygoni*) [ibid., 18, p. 599].

Willison (R. S.). **Virus diseases of stone-fruit trees. Proceedings of the Association of Applied Biologists.**—*Ann. appl. Biol.*, 37, 1, pp. 127–130, 1950.

In this review of the work done in North America on the virus diseases of stone fruits [*R.A.M.*, 28, p. 508], the author announces that the 'Handbook of virus diseases of stone-fruits in North America' [ibid., 22, p. 142] is in process of

re-publication in revised and illustrated form. An account is given of symptom expression of stone fruit viruses in general (termed as 'shock' and 'chronic'), and of some of the important diseases occurring in Ontario, including sour cherry yellows [ibid., 28, p. 223], and necrotic ring spot, sweet cherry tatter leaf [ibid., 28, p. 442], and prune [plum] dwarf [ibid., 25, p. 304].

WANN (F. B.) & THORNE (D. W.). **Zinc deficiency of plants in the western States.**—*Sci. Mon., N.Y.*, 70, 3, pp. 180–184, 2 figs., 1 map, 1950.

The zinc deficiency situation in the western United States is reviewed in the light of 21 contributions to the relevant literature. The condition is present to a serious extent in all the major fruit- and nut-producing areas, and the cost of maintaining the crops in a healthy condition, usually by means of a dormant spray of zinc sulphate (25 to 50 lb. per 100 gals.), is of economic significance, amounting in California, for instance, to nearly $1,500,000 per annum. There is evidence of a gradual depletion of the available zinc in the deeper soil strata under orchard trees, which is likely to lead to a considerable extension in the distribution of the deficiency in years to come.

FOLSOM (D.). **Comparative effects of certain sulphur fungicides on McIntosh Apple trees.**—*Bull. Me agric. Exp. Sta.* 464, 31 pp., 7 graphs, 1948.

In experiments carried out in Maine from 1928 to 1943, inclusive, 335 McIntosh apple trees in 45 ten-tree plots were treated with dry lime-sulphur spray and elemental sulphur spray and dust, the plots being assigned in equal numbers to the different treatments that were the same on the same plots year after year [cf. *R.A.M.*, 27, pp. 74, 510; 28, p. 441].

Scab [*Venturia inaequalis*: ibid., 27, pp. 509, 573; 29, pp. 101, 262] control with elemental sulphur spray was less effective on leaves but more so on fruits than that given by lime-sulphur spray, though the final result on fruit scab was about the same for the two. Good scab control was obtained by dusting except when too little dust was used. Lime-sulphur often caused more fruit russeting than did elemental sulphur, but otherwise it slightly improved fruit colour.

Lime-sulphur decreased bloom and increased early summer drop, but rather larger fruit developed. The increase in yield from using elemental sulphur instead of lime-sulphur over a ten-year fruiting period was 32 per cent., or more than 5 bush. per tree, while the extra cost for the ten years was only about five cents per tree. When some trees were then shifted from elemental sulphur to lime-sulphur or *vice versa* there was a delay of one year before the change affected bloom and fruit yield. Trunk growth remained unaffected by fungicidal treatment, so that after using lime-sulphur for some years, maximum fruit yield was obtained one year after changing to a less injurious fungicide.

With a longer interval between pre-pink and calyx sprays, as in years when May was a wet month, there was more leaf scab and more lime-sulphur fruit drop. It is possible, from the pre-pink, pink, and calyx spray dates, to draw up a table for forecasting the later dates. This permits planning for a mid-bloom application in years when the interval between the early bloom stages will probably be long, and for the use of more cover applications in years with earlier calyx spray dates.

Effective scab control resulted from the application of 21 gals. spray per tree per season (three gals. per application), even when the trees had been 17 years in the orchard and were yielding seven bush. per tree per year.

FISCHER (H.). **Schorfbekämpfungsversuche 1949.** [Scab control experiments 1949.] —*Schweiz. Z. Obst- u. Weinb.*, 59, 3, pp. 50–63, 6 figs., 1950.

A tabulated survey is given of further large-scale experiments in apple scab [*Venturia inaequalis*] control in several parts of the cantons of Bern, Zürich, and

Thurgau, Switzerland [*R.A.M.*, 28, p. 460]. The fungicides comprised four wettable sulphurs, with and without the addition of a 50 per cent. copper oxychloride dust, and the standard lime-sulphur plus copper oxychloride for comparative purposes. The copper oxychloride dust and the wettable sulphurs thiovit (Sandoz), Geigy, sofril (Maag), and sufralo (Siegfried) were definitively approved.

Fortieth Annual Report of the John Innes Horticultural Institution, 1949.—29 pp., 1950.

On p. 7 of this report [cf. *R.A.M.*, 28, p. 509] it is stated that work by W. R. Stanton has shown that clonal isolates of *Venturia pirina* [ibid., 26, p. 499] on synthetic media vary in colour, shape, and size of colony, even isolates from the same pear fruit. Differences in susceptibility of different varieties have been demonstrated, using pure strains of the fungus. Seedlings, some of which became infected in their first year, fell into two distinct classes, resistant and susceptible.

Petersen (D.) & Cation (D.). **Exploratory experiments on the use of acti-dione for the control of Peach brown rot and Cherry leaf spot.** —*Plant Dis. Reptr*, 34, 1, pp. 5–6, 1950. [Multilithed.]

In an exploratory experiment at Michigan Agricultural Experiment Station on the field control of peach brown rot (*Monilinia* [*Sclerotinia*] *fructicola*) [*R.A.M.*, 29, p. 159] actidione [ibid., 29, p. 373] caused severe injury to ripening fruit, and appears of doubtful value for control. Concentrations of 1, 5, and 10 p.p.m. were then applied to unsprayed three-year-old Montmorency cherry trees with nearly 100 per cent. leaf infection with leaf spot (*Coccomyces hiemalis*) [ibid., 28, p. 219]. On 29th August, when the actidione was applied, the trees showed about 20 per cent. defoliation. By 4th October the application of 10 p.p.m. had delimited all leaf spot lesions. Under 1 per cent. of the lesions were active on the trees given 1 p.p.m., though many active lesions were present on trees treated for purposes of comparison with other fungicides. The trees sprayed with actidione were conspicuously green, and had retained a greater percentage of their leaves than the others, unsprayed trees being completely defoliated.

Poulos (P. L.). **The use of sodium hypochlorite for the control of the brown rot disease of Peach in Delaware.**—*Plant Dis. Reptr*, 33, 11, pp. 413–415, 1949. [Mimeographed.]

Sodium hypochlorite (0·4 gals. clorox per 100 gals. water) [*R.A.M.*, 29, p. 34], two to five applications as a pre-harvest spray, failed to control brown rot (*Monilia* [*Sclerotinia*] *fructicola*) [loc. cit.] on Early Redfree, Halehaven, and Elberta peaches in Delaware, 14 to 45 per cent. infection resulting, as compared with 8 to 36 per cent. in the untreated controls. On the other hand, a pre-packing dip, using Triogem, Halehaven, and Elberta peaches (1 to 16 gals. clorox per 100 gals. water) and subsequent storage 80° F. for four days, resulted in 22·8 to 63·6 per cent. infection, as against 29·4 to 82·4 per cent. in the untreated.

Weimer (J. L.) & Dunegan (J. C.). **Identity of anthracnose of Lupine and Peach caused by Glomerella cingulata.**—*Plant Dis. Reptr*, 33, 11, pp. 416–418, 1949. [Mimeographed.]

In cross-inoculation experiments at the Georgia Experiment Station in 1949 with *Glomerella cingulata* from peach and lupin [*R.A.M.*, 28, p. 381] all the petioles of blue lupin (*Lupinus angustifolius*) plants inoculated with the fungus from peach were dead, and typical anthracnose lesions were present on the leaflets. Those inoculated with the lupin isolate were also infected. Further inoculations of lupins with the two isolates and with a re-isolate from lupin also caused heavy infection.

Wound inoculation of Dixigem peach fruits, using the three isolates and a recent one from a lupin seed, resulted in typical anthracnose lesions 2 to 3 cm. in diameter at the point of inoculation. The fungus was re-isolated from the lesions.

Wenzl (H.). **Die Bekämpfung des amerikanischen Stachelbeermehltaus (Sphaerotheca mors uvae).** [The control of the American Gooseberry mildew (*Sphaerotheca mors-uvae*).] —*PflSch. Ber., Wien*, 4, 3–4, pp. 47–56, 1950. [English summary.]

Very encouraging results were obtained in experiments in 1949 at Höflein-on-the-Danube, Austria, in the control of American gooseberry mildew (*Sphaerotheca mors-uvae*) on the Red Greifenstein variety [*R.A.M.*, 28, p. 224; cf. also ibid., 29, p. 34] by spraying with alkaline Burgundy mixture (0·75 parts each of copper sulphate and calcined soda in 100 of water). For later treatments (after the berries have reached the size of peas) a 0·5 per cent. solution of calcined soda alone should be used to obviate the disagreeable flavour imparted by copper at this stage. The addition of a spreader, such as 0·2 per cent. sandovit, considerably enhances the effect of the sprays. Satisfactory dormant treatments comprised standard lime-sulphur (12·5 per cent.), sandolin yellow spray, containing dinitro-ortho-cresol (1·5 per cent.), and mineral oil carbolineum (6 per cent.).

Plant protection. Approved Strawberry planting material.—*Qd agric. J.*, 70, 2, p. 91, 1950.

In accordance with the scheme for providing approved strawberry runners, initiated in 1947 with a view to reducing the incidence of strawberry virus diseases in Queensland, a list is given of the growers whose crops were approved by the Department of Agriculture and Stock in 1949. The accepted varieties are Phenomenal, Usher, Aurie, and Rex. In future it will be necessary for growers desiring to have their strawberry crops approved to plant runners from approved runner beds.

Thirumalachar (M. J.), Subba Rao (D. V.), & Ravindranath (V.). **Telia of the rust on cultivated Figs.**—*Curr. Sci.*, 19, 1, pp. 27–28, 2 figs., 1950.

Cerotelium fici occurs on all species of *Ficus*, including the cultivated fig [*R.A.M.*, 26, 331; 28, p. 8], only in the uredo stage, except in one collection of the teleuto phase made by Butler in India on *F. glomerata* (*Ann. mycol., Berl.*, 12, pp. 76–82, 1914). Recently the rust was again observed in the perfect state on cultivated figs at the Hindu University, Benares, during the period of defoliation in November. The cinnamon-yellow, waxy, subepidermal, erumpent teleutosori are distinguishable from the uredosori by their less powdery appearance under magnification. The hyaline, unicellular, concatenate, oblong-ellipsoid to ovate teleutospores measure 14 to 21 by 11 to 13 μ, thus agreeing closely with Butler's measurements of 15 to 22 by 10 to 13 μ, and germinate immediately. The heavy defoliation of the shoots at the fruiting stage due to *C. fici* causes no serious damage since the loss is repaired by vigorous replacement.

Green (E. L.). **Adhesives for fungicide dusts.** —*Industr. Engng Chem.*, 42, 2, pp. 324–330, 4 figs., 1950.

An apparatus is described for the laboratory testing of fungicides on small objects, such as potted plants or glass plates. The fungicide (sulphur in these experiments) is fed into a small rotary blower. Water equal to four times the weight of the solid is added as a spray to the air stream as it leaves the machine. Glass microscope slides were used as test objects, because they could be weighed to measure the deposits as first laid down and after exposure to artificial rains in the form of spray from a very old 'Bordeaux nozzle', in which a cylindrical jet is spread out into a fan by impinging against a plane surface inclined to it at an acute

angle. The test adhesives (110 in all, offered for the purpose by commercial firms) were dispersed in the water used to moisten the dust.

Only a few of the compounds were of any interest for the purpose in view, among them being Du Pont spreader-sticker [*R.A.M.*, 28, pp. 127, 258, 313], Wilson's spred-o-stik (Andrew Wilson, Inc., Springfield, N.J.), and polyethylene glycol 600 mono-oleate (Kessler Chemical Co., Inc., Philadelphia 35, Pa).

YARWOOD (C. E.). **Effect of temperature on the fungicidal action of sulphur.**—*Phytopathology*, 40, 2, pp. 173–180, 1 diag., 3 graphs, 1950.

In experiments at the University of California, Berkeley, to determine the relation of temperature to the fungicidal activity of sulphur [cf. *R.A.M.*, 21, p. 422], bean [*Phaseolus vulgaris*] leaf disks bearing a dried deposit of lime-sulphur (applied with a spreader) were placed on or over the surface of detached bean leaves inoculated with *Erysiphe polygoni* [ibid., 27, p. 248]. The leaves were floated on 8 per cent. sucrose solution in the dark for periods ranging from 10 minutes to 100 hours at temperatures from 7° to 43° C. The development of infection was inhibited over varying distances beyond the sulphur disks and they increased with the time of exposure and with rising temperature within the limits indicated. When the diameter (in mm.) of the inhibition zones was plotted against the logarithm of the time of exposure to sulphur, the time-response relation approximated to a straight line with a temperature co-efficient of 4·8. The inhibition zone for 10 per cent. lime-sulphur applied for 31 hours at 24° averaged 16 mm. in diameter and those for 3 per cent. elemental sulphur 10·5 mm.

When bean leaves inoculated three to five days earlier with uredospores of *Uromyces phaseoli* were exposed in sealed jars to the gas resulting from the reaction of sodium sulphide solutions with sulphuric acid, the mycelium was destroyed without damage to the leaf if the pH and concentration of the sodium sulphide and the length of exposure to its action were correctly adjusted. When the logarithm of the concentration of 50 ml. sodium sulphide at pH 1·8, requisite for the complete therapy of bean rust in seven hours, was plotted against the temperature during exposure to the vapour, the temperature-concentration relation was roughly identical with the temperature-time relation for the eradication of *E. polygoni* described above. The lowest dosage which completely suppressed rust development averaged (five tests) 0·00035 per cent. sodium sulphide at 37°, 0·0015 at 25°, and 0·02 at 13°.

FATTINGER (D.). **Die Beeinflussung der fungiziden Wirksamkeit des Kupferions durch andere Ionen.** [The influence of other ions on the fungicidal efficiency of the copper ion.]—*PflSch. Ber., Wien*, 4, 3–4, pp. 33–46, 1950. [English summary.]

An account is given of experiments to determine the influence of other ions on the toxicity of the copper ion to pure cultures of *Alternaria tenuis* and *Trichothecium roseum* on Henneberg's nutrient agar. In mixtures, nickel and zinc and more particularly cadmium and cobalt considerably enhanced the toxicity as compared with the sum total of the effects of the individual components. A substantial reduction in the fungicidal efficacy of copper was effected by an admixture of boric acid or manganese, and a slighter one by iron, aluminium, and barium.

BLUMER (S.) & KUNDERT (J.). **Die biologische Laborprüfung von Kupferpräparaten.** [The biological, laboratory evaluation of copper preparations]—*Annu. agric. Suisse*, 50, 6, pp. 557–594, 2 figs., 1 diag., 6 graphs, 1949. [French summary.]

The Banco Palagi spraying apparatus, devised by Ciferri and his collaborators for the toxicometric determination of fungicides [*R.A.M.*, 25, pp. 221–224; 27, p. 484] and modified by L. Zobrist (Chemische Fabrik R. Maag, Dielsdorf), has given very satisfactory results in laboratory tests at the Federal Research Institute

for Fruitgrowing, Viticulture, and Horticulture, Wädenswil, Switzerland. For the evaluation of copper-containing sprays *Alternaria tenuis* (Pavia strain) proved more suitable than *Venturia pirina*, *Clasterosporium carpophilum*, *Monilia* [*Sclerotinia*] *fructigena*, or *Botrytis cinerea*. Under reasonably constant conditions *A. tenuis* showed the smallest variations in sensitivity to copper and germinated well and regularly. Comparisons of the fungicidal action of the various test preparations are based on the LD_{50} values ascertained by the graphic method, the abscissa being the logarithm of the concentration of the product used and the ordinate the percentage of non-germinated spores transformed into probits. The LD_{50} value obtained for any given preparation must always be compared with that of standard Bordeaux mixture. The germination test is applicable in the first place to the determination of the inherent toxicity of different factory samples. In experiments on finished commercial preparations significance must be attached not only to the active principle, but also to secondary substances. The Ciferri-Zobrist apparatus did not permit of differentiation between the individual factors. Significant differences were detected in the fungicidal efficiency of the several preparations comprised in a group of products, but nevertheless the Bordeaux co-efficients were found to be reasonably constant. Although the final verdict on any particular fungicide must rest on field experiments, preparations of insufficient efficacy can be discarded on the basis of the germination tests.

Soo-Hoo (G.) & Grunberg (E.). **The anti-fungal activity of metal derivatives of 3-pyridinethiol.**—*J. invest. Derm.*, 14, 3, pp. 169–172, 1950.

The anti-fungal activity of the metal derivatives of 3-pyridinethiol was tested against two plant pathogens (*Fusarium oxysporum* and *Botrytis paeoniae*), two dermatophytes, and a number of bacteria at the Department of Chemotherapy, Hoffmann–La Roche Inc., Nutley, New Jersey. The 50 per cent. growth-inhibiting concentrations in experiments with the plant pathogens ranged from 1 in 20,000 to 1 in 100,000, *F. oxysporum* being generally more sensitive than *B. paeoniae*. The following order of relative fungistatic activity was demonstrated for the metallic components: manganese < copper < iron < mercury < zinc.

Ten Houten (J. G.). **Organisatie en taak van het Instituut voor Plantenziektenkundig Onderzoek (I.P.O.).** [Organization and purpose of the Institute for Phytopathological Research (I.P.O.).]—Reprinted from *Meded. Direct. Tuinb.*, 13, 5 pp., 1950. [English translation.]

The co-ordination of long-range research on agricultural and horticultural crop pathogens, conducted in various parts of Holland, is the object of the newly founded Institute for Phytopathological Research, sponsored by the Ministry of Agriculture. The work of the Institute is to be concerned mainly with the study of pests and diseases which are not well enough understood for effective control, and will be divided among three departments, the entomological, directed by Dr. S. Leefmans, the virological (Dr. T. H. Thung), and the mycological-bacteriological (Dr. J. G. ten Houten).

Garrett (S. D.). **Ecology of the root-inhabiting fungi.**—*Biol. Rev.*, 25, 2, pp. 220–254, 1950.

Most of the 139 contributions to the literature on the ecology of root-inhabiting fungi, on which the author's critical survey is based, have been noticed from time to time in this *Review* [*R.A.M.*, 24, p. 199]. An introduction to the subject is followed by sections on soil- and root-inhabiting fungi, including (1) the distinguishing characteristics, (2) host-parasite relationship as a determinant in the segregation of root-inhabiting fungi, and (3) loss of competitive saprophytic ability by root-inhabiting fungi; microbiological interactions of root-inhabiting fungi in the

expanding, parasitic phase, including (1) general characteristics of the root surface and rhizosphere microfloras, (2) interactions of root-inhabiting fungi with root surface and rhizosphere microfloras, and (3) interactions of root-inhabiting fungi with associated micro-organisms within the host tissues; and microbiological interactions of root-inhabiting fungi in the declining, saprophytic phase.

Iodine and plant life : annotated bibliography 1813-1949.—ix+114 pp., 1 diag., London, Chilean Iodine Educational Bureau, Stone House, Bishopsgate, E.C. 2, 1950.

This book, the first of a series of annotated bibliographies concerning the role of iodine in biology and medicine [*R.A.M.*, 28, p. 487], includes 794 references relating to fundamental and applied knowledge of iodine in relation to vegetable life, published from 1813 to 1949. There is an introductory review (24 pp.) of the literature on the iodine content of plants, the effect of iodine on growth and development of higher plants and bacteria and fungi, and its use in plant protection.

Morstatt (H.). **Bücher über Pflanzenpathologie und Pflanzenschutz. Eine Bibliographie.** [Books on plant pathology and plant protection. A bibliography.]—*Mitt. biol. ZentrAnst. Landw., Berl.*, 68, 52 pp., 1950.

This bibliography of German and foreign books, published for the most part between 1900 and 1949 [cf. *R.A.M.*, 17, p. 336], is in two sections, the first dealing with plant pathology and general plant protection, and the second with the diseases and pests of individual crops. An index of authors is appended.

Dexter (S. T.). **A modified wet- and dry-bulb thermometer technique for determining the moisture content or storage qualities of so-called dry materials.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 31, 3, pp. 275–286, 1949.

The author describes a method to determine the relative humidity of a stored product by using a small sample of it [cf. *R.A.M.*, 27, p. 575]. A modified form of the wet and dry bulb thermometer is used, a solution being selected for moistening the wet bulb that is suited to the range of humidities and moistures tested, so that only slight evaporation or absorption of water vapour is required. In the author's experiments the two thermometers (range 10° to 110° C.) were inserted in a large two-hole rubber stopper. Over the bulb of one a tight bag made of two layers of cheesecloth was placed, moistened with a saturated solution of the compound. The dry bulb thermometer extended about 4 in. through the stopper, and the wet bulb about 2 in. The container was usually a 1,000 c.c. flask or a quart bottle wrapped with paper to obviate temperature disturbances when handling. The samples used occupied one-third to one-half the container, i.e., about 300 gm. wheat or 200 gm. oats. With sugar beet pulp, ground grains, or sawdust, samples of 50 gm. gave the same results as larger ones. With thermometers and stopper in place the bottle was vigorously shaken for about 30 to 90 seconds until the reading of the wet bulb was constant. If shaking has to be continued for over two minutes, the relative humidity of the sample is probably outside the best range of the solution in use.

For farm grains (15 per cent. moisture) a saturated solution of sodium chloride (75 per cent. relative humidity) is suitable for the wet bulb; for drier materials magnesium chloride (32 per cent. R.H.) and for rather higher relative humidities potassium chromate (88 per cent.) or barium chloride (91 per cent.) are recommended. Manganous chloride (54 per cent.) is also specially constant. For greatest accuracy, heating or cooling of the wet bulb should be small.

Steffens (H. G.). **Quick test for fungus resistance.**—*Mod. Packag.*, 22, 11, pp. 168–169, 7 figs., 1949.

The following reasonably exacting method has proved useful in the testing of

packaging materials for fungal resistance at the Cap-Seal Division, Irvington Varnish and Insulator Co., Irvington, New Jersey. The test organism is *Aspergillus niger* (e.g., Harvard University No. 26 or A.T.C.C. 9642), selected on account of its virtual ubiquity, and capacity for the tolerance of very high osmotic pressures and very low moisture thresholds. Bacterial contamination may be avoided by using the following medium: 20 gm. dextrose, 1 gm. ammonium nitrate, 0·75 gm. hydrated magnesium sulphate, 0·5 gm. each of potassium dihydrogen phosphate and dipotassium hydrogen phosphate, 24 gm. agar, and distilled water to make 1,000 ml.

Specimens for testing are prepared as follows. Adhesives are coated on a $\frac{3}{4}$-in. microscope cover-slip and dried for about 15 minutes at 130° to 150° F. Waxes are cut into slabs $\frac{3}{4}$ in. sq. by $\frac{1}{10}$ in. from the central part of a sample. Paper, board, cork, etc., are cut into pieces $\frac{3}{4}$ in. sq. They are placed directly on the agar surface previously inoculated with 0·8 ml. spore suspension of *A. niger* and 0·2 ml. suspension is applied to the surface of the specimen. The fungicidal liquid is then spread evenly over the specimen surface with a sterile wire loop and the plate is incubated at 85° to 90° and 96 to 100 per cent. relative humidity in darkness for seven days.

Fungal resistance is rated according to the following schedule: (A) no mycelial growth—completely inhibitive; (B) some mycelial growth and some sporulation—partly inhibitive; (C) sporulation up to, but not on specimen—non-inhibitive, non-nutritive; (D) meagre sporulation on specimen—non-inhibitive, fairly nutritive; and (E) specimen indistinguishable—completely nutritive. It is suggested that for purposes of liner-closure-testing a minimum rating of (C) should be required.

This relatively simple method may be extended to yield further information regarding protection by the use of mixed spore suspensions. For instance, *Chaetomium globosum* may be added to or substituted for *A. niger*, while mixed spore suspensions of *A. niger*, *A. flavus*, *Penicillium luteum*, and *Trichoderma* T-1 are applied in tests of fungal resistance of electronic equipment used in military and naval service [cf. *R.A.M.*, 25, pp. 174, 466]. In such cases, however, the technician should be assured of the mutual tolerance or compatibility of the several organisms, since many species are markedly antagonistic, e.g., *P. rugulosum* and *A. niger*.

Grosjean (J.). **Substances with fungicidal activity in the bark of deciduous trees.**—*Nature, Lond.*, 165, 4204, pp. 853–854, 1950.

Further studies were carried out at the Phytopathological Institute, Wageningen, on the fungistatic activity of bark extracts from poplars [*R.A.M.*, 25, p. 69]. When extracts from *Populus candicans* and *P. trichocarpa*, concentrated by evaporation of water at boiling point, were added in sufficient concentration to a nutrient agar the growth of *Stereum purpureum* was completely inhibited and the fungus died. Extracts from *P. regenerata*, *P. serotina erecta*, and *P. marilandica* were also active. The bark of *P. monilifera*, *P. robusta*, *P. fremontii*, *P. wislizenii*, and *P. eugenii* was only very slightly fungicidal.

Leaf extracts from *P. candicans* also showed fungicidal activity, but were weaker than those from the bark.

Gäumann (E.), Naef-Roth (St[ephi]), & Ettlinger (L.). **Zur Gewinnung von Enniatinen aus dem Myzel verschiedener Fusarien.** [On the extraction of enniatins from the mycelia of various *Fusarium* spp.]—*Phytopath. Z.*, 16, 3, pp. 289–299, 1950.

A method is described for the determination of the antibiotic activity in serial dilution tests of the enniatins (virtually insoluble in water) extracted from the mycelium of various species of *Fusarium* [*R.A.M.*, 27, p. 488]. Optimal conditions for the production of enniatin A by *F. oxysporum* E.T.H. 1523/8 were provided by

a modified Richards's solution, a temperature range of 27° to 30° C., and 18 to 21 days in surface culture or four to five in shake culture. Enniatin A inhibited the growth of *Merulius domesticus* [*M. lacrymans*] at a concentration of 0·005 mg. per ml., of *Calonectria graminicola* [*C. nivalis*], *Helminthosporium gramineum*, *Coniophora cerebella* [*C. puteana*], and *Rhizoctonia crocorum* [*Helicobasidium purpureum*] at 0·01; of *Clasterosporium carpophilum*, *Lenzites abietina*, *Polystictus versicolor*, and *Endostigme* [*Venturia*] *inaequalis* at 0·02; of *Ophiobolus graminis* at 0·05; and of *Armillaria mellea* at 0·5. The antibiotic properties of enniatins B and C are weaker than those of A.

Guérillot-Vinet (J.), Guérillot-Vinet (Mme), Guyot (L.), Montégut (J.), & Roux (L.). **Sur une substance antibiotique extraite du mycélium de Gibberella baccata (Wallr.) Sacc.** [On an antibiotic substance extracted from the mycelium of *Gibberella baccata* (Wallr.) Sacc.] —*C.R. Acad. Sci., Paris*, 230, 15, pp. 1424–1426, 1950.

From cultures of *Gibberella baccata* [*R.A.M.*, 25, p. 366; 26, pp. 270, 328], collected on *Clematis vitalba* at the School of Agriculture, Grignon, Seine-et-Oise, a substance was extracted which exerted a marked fungistatic action on *Leptosphaeria acuta* and *Sclerotinia libertiana* [*S. sclerotiorum*] and a weaker one on *L. culmifraga*, *L. culmorum*, *Ophiobolus herpotrichus*, and *Wojnowicia graminis* [agents of cereal foot rots: ibid., 13, p. 568]. It was also toxic to *Pseudomonas medicaginis*. The antibiotic, which is named baccatine A, is soluble in ether and other organic solvents but only slightly so in water.

Downie (D[orothy] G.). **The germination of Goodyera repens (L.) R.Br. in fungal extract.**—*Trans. bot. Soc. Edinb.*, 35, 2, pp. 120–125, 1950.

Research [? at Aberdeen University] showed that a hot-water-soluble extract of the disintegrated mycelial mats of the endophytic fungus from *Goodyera repens* [*Rhizoctonia goodyerae-repentis*: *R.A.M.*, 24, p. 28] considerably stimulated the development of the embryos. As the total sugar concentration of the extract is insufficient to stimulate growth, an activating substance (or substances) must be present. This is stable at 70° C. but unstable at 100°. Both alcohol-soluble and alcohol-insoluble fractions of the extract stimulated development, especially the latter, but growth tended to be abnormal.

Downie (D[orothy] G.). **The germination of Listera ovata (L.) R.Br.**—*Trans. bot. Soc. Edinb.*, 35, 2, pp. 126–130, 1950.

Two species of *Rhizoctonia* formed mycorrhiza in the roots of adult *Listera ovata* plants from Cupar, Fife. One grows fast on potato dextrose agar, its hyphae measuring 5 μ in diameter, and the oidia 28 by 12 μ. The other grows slowly on the medium, the diameter of the vegetative hyphae is 1·4 μ, and the oidia average 7 by 5 μ. The second stimulated germination of the seed of *L. ovata* on distilled water agar; the former did not activate the growth of the embryo on any media tested. The seed did not germinate in nutrient salt solution in the absence of a symbiotic fungus.

Bertrand (G.) & Bertrand (D.). **Haute teneur en rubidium de certains champignons.** [High rubidium content of certain fungi.]—*C.R. Acad. Agric. Fr.*, 35, 1, pp. 38–39, 1949.

In phanerogams the average amount of rubidium present is about 20 mg. per kg. dry matter. Analyses of 24 species and varieties of *Rhodopaxillus*, *Tricholoma*, and *Cortinarius* showed that only five fungi contained under 100 mg. [see next abstract]. Twenty yielded several dg. and in one instance the figure reached 28 dg.

Bertrand (G.) & Bertrand (D.). **Migration du rubidium dans l'organisme de quelques champignons hyménomycètes.** [Rubidium migration in some Hymenomycetes.]—*C. R. Acad. Agric. Fr.*, 35, 2, pp. 73–75, 1949.

Analyses of four lots of mushrooms [*Psalliota* spp.] from one bed in different stages of development with gills colourless, pink, turning brown, and dark brown showed the rubidium content [see preceding abstract] to be, respectively, 42·7, 133, 34·2, and 19·6 mg. per kg. dry matter. Analyses of *Paxillus involutus* showed that the pileus always contained more rubidium than the stipe, and that the gills were considerably richer in this element than other parts of the pileus. Rubidium thus appears to play some part in the development and, particularly, in the sporogenesis of Basidiomycetes.

Barnett (H. L.) & Lilly (V. G.). **Influence of nutritional and environmental factors upon asexual reproduction of Choanephora cucurbitarum in culture.**—*Phytopathology*, 40, 1, pp. 80–89, 1 graph, 1950.

At the West Virginia Agricultural Experiment Station the production of conidia by *Choanephora cucurbitarum*, the agent of a rapid flower and young fruit rot of cucurbits and other plants [*R.A.M.*, 19, p. 514 *et passim*], was found to be influenced by the amounts of thiamine [ibid., 28, p. 637] and sugar in the synthetic medium as well as by temperature, light (*J. Elisha Mitchell sci. Soc.*, 54, pp. 297–310, 1938), and aeration. Sporangial formation was appreciably affected only by the temperature factor. A temperature of 31° C. during sporulation was adverse to conidial production but permitted the formation of many more sporangia (1,200 per culture) of distinctly larger dimensions (145 μ in diameter) than those (300) developing at 25° (60 to 90 μ). Aeration of the cultures was essential to the production of conidia. Both continuous bright light, supplied by a 40-watt daylight fluorescent tube, and total darkness prevented the formation of conidia, but they developed in cultures incubated in continuous light of very low intensity (less than 1 foot-candle) for three days. Conidial production was favoured by exposure to bright light to permit adequate mycelial growth, followed by two or more hours of darkness, but a reversal of this order inhibited the process. The number of conidial heads increased with the lengthening of the exposure to light (following and preceding darkness) from four to ten hours, only a few being formed after the former period as against 200 and 1,000 after five and eight hours, respectively.

Bode (O.). **Über den Einfluss der Düngung auf die Ausbreitung der Blattrollkrankeit der Kartoffel.** [On the influence of fertilizing on the dispersion of the Potato leaf roll disease.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 1, 11, pp. 148–151, 1 graph, 1949.

A tabulated survey is given of experiments carried out at the Institute of Agriculture of the University of Göttingen, Germany, to determine the eventual influence of fertilizers on the incidence of potato leaf roll [*R.A.M.*, 29, p. 47]. The trial plots had been under cultivation since 1875, and during this period had been enriched with all possible combinations of the three basic fertilizers, nitrogen, potash, and phosphorus. An inspection of the field in the summer of 1945 revealed more extensive leaf roll infection on the plots receiving potash than on the others, and the results of the subsequent investigations confirmed this observation. Thus, the average percentages of leaf roll from 1945 to 1947 in the Böhms Mittelfrühe variety in the experimental plots were as follows: (1) untreated 21·1±3·6, (2) nitrogen (as ammonium sulphate) at a dosage of 60 kg. per ha. 20·2±3, (3) phosphorus (as superphosphate) at 36 kg. per ha. 24·6±4·3, (4) potash (containing about 60 per cent. potassium chloride) at 120 kg. per ha. 48·2±8·6, (5) potash and phosphorus 32·3±2·5, (6) nitrogen and phosphorus 17·1±3·6, (7) potash and

nitrogen 64·4±11·6, and (8) complete fertilizer 63·5±8·6. Over the same period the following yields were obtained: (1) 277·1 doppelzentner [1 doppelzentner = 100 kg.] per ha., (2) 276·3, (3) 281·3, (4) 244·5, (5) 266, (6) 285·8, (7) 236·2, and (8) 256·3. Since there is no evidence that potash soil amendments actually stimulate aphid increase, it must be assumed that they induce some constitutional modification in the plants which favourably affects both the function of the viruliferous aphids and the multiplication and transport of the virus itself.

In further experiments at the Virus Research Institute, Celle, using the variety Ackersegen in 1947 and Flava in 1948, the average percentages (four replications) of leaf roll were as follows: 1947, (1) untreated 27·1±2·84, (2) nitrogen (42 kg. per ha.) 41±13·6, (3) potash (50 per cent.) at 160 kg. per ha. 49·1±5·28, (4) potash and nitrogen 50·6±6·7, and (5) complete fertilizer 42·1±11·7, the corresponding figures for 1948 being (1) 18·9±3·4, (2) 34·2±5·1, (3) 49·7±7·2, (4) 52·4±4·2, and (5) 58·6±5·3.

Bercks (R.). **Über des Verhalten verschiedener X-Virusherkünfte bei Infektionsversuchen an mehreren Kartoffelsorten. (Vorläufige Mitteilung.)** [On the mode of action of various X-virus strains in inoculation experiments on several Potato varieties. (Preliminary note).]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 1, 12, pp. 171–173, 1949.

Further inoculation experiments with the Cs 35 strain of potato virus X on the Flava potato variety confirmed the previous year's results [*R.A.M.*, 29, p. 378]. Neither greenhouse nor field plants contracted infection, and the virus was detected only here and there in isolated leaves. In further tests on Flava and eight other varieties with several strains of virus X, including one from Erstling [Duke of York], differences were apparent not only in the host responses but also in the mode of action of the individual collections. All the varieties acquired immunity from infection with advancing age.

Ziegler (O.). **Ist eine scharfe Abgrenzung der Kartoffelsaatbaugebiete notwendig?** [Is a strict demarcation of the Potato seed-producing areas necessary?]—*Pflanzenschutz*, 2, 3, pp. 25–26, 1950.

This is a discussion of the provisions of the Bavarian 'Order for the control of virus diseases of the potato' [*R.A.M.*, 29, p. 225] and the manner of their application.

Bartels (R.). **Über Versuche zur Herstellung eines Antiserums gegen Kartoffel-Blattroll-Virus.** [On experiments for the production of an antiserum against Potato leaf roll virus.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), 2, 3, pp. 38–40, 1950.

Negative results were obtained in experiments on the production of potato leaf roll antisera from the juice of infected *Physalis angulata* plants [*R.A.M.*, 28, p. 78].

Bald (J. G.) & Hutton (E. M.). **Some effects of leaf-roll virus on the development and growth of the potato plant.**—*Aust. J. agric. Res.*, 1, 1, pp. 3–17, 2 graphs, 1950.

During 1945–6 a detailed field trial and other experiments at Canberra were made to explore the effects of leaf roll on the growth of different varieties of potato [*R.A.M.*, 26, p. 258; 27, p. 578]. The shoots of infected, tolerant Up-to-Date were little changed in size at emergence, but the growth rate of the haulm was reduced during the early vegetative stage of development. The shoots of intolerant Bismark were probably smaller in size at emergence, and during the vegetative stage of development the tops grew at the same reduced rate as Up-to-Date. Brownell, Katahdin, and Snowflake, intermediate in tolerance, were intermediate in growth reaction.

During the first stages of tuberization in infected Up-to-Date there were no serious changes in stolon length or the time of tuber initiation. Bismark reacted with shortening of the stolons and hastening of tuber initiation. The number of leaves developing on the main axes of both tolerant and intolerant varieties was reduced by the presence of the virus. The reduction in the proportion of leaf area contributed by axillary shoots to the total leaf area of infected plants was similar in both types in spite of the difference in the size of the plants. In Bismark there was a change in the type of axillary growth above ground as well as a change in vigour. The course of development of the foliage during maturity and senescence demonstrated the serious alteration in growth characteristics of intolerant plants. There was relatively little alteration in Up-to-Date.

Incomplete data suggest that losses in yield due to infection are not caused by a reduction in efficiency (per unit of leaf area) in tuber production, but by factors such as reduced growth rate and lessening in size of the haulm.

The first step in breeding for resistance under Australian conditions has been to cross and select for intolerance. Work [unpublished] has shown that the intolerance of Bismark is difficult to recover in the progeny of outcrosses, whereas that of Snowflake is recovered. The fact that it is possible for an intolerant variety such as Bismark to react in a tolerant fashion under certain conditions has increased the difficulties of selecting. It appears, therefore, that the best approach to the problem of resistance lies in developing varieties which when infected with leaf roll, give definite and unmistakable symptoms irrespective of growing conditions. A clearer understanding of the physiological processes determining tolerance or intolerance of leaf roll in a variety is needed before breeding for resistance can be placed on a sound basis.

Two of the marked anatomical changes, which result from the development of leaf roll in both types of varieties, are the distension of the chloroplasts with starch granules and phloem necrosis. The extent of the latter may be greater in intolerant than in tolerant varieties.

Rich (A. E.) & Locke (S. B.). **Varietal differences in the development of internal discoloration of Potato tubers in Washington, 1948.** —*Plant Dis. Reptr*, 34, 1, pp. 19–20, 1950. [Multilithed.]

In 1948, about 120 tubers each of 22 potato varieties and seedlings grown for experimental studies in three localities in Washington State were stored in an unrefrigerated cellar or at 44° F. In the spring of 1949 Ashworth exhibited by far the greatest amount of phloem necrosis, with 163 of 357 tubers (45·7 per cent.) visibly affected. Russet Burbank (Netted Gem), Warba, Red Warba, Ontario, Cayuga, Chenango, and Snowdrift showed 2·2 to 6 per cent. phloem necrosis. Most of this discoloration is attributed to current leaf roll infection. All the varieties showed some xylem discoloration.

The cut tubers were planted in the spring of 1949. All the varieties developed enough leaf roll to account for the amount of phloem necrosis observed. White Rose, Mesaba, Calrose, Kennebec, Placid, and C.S. 6316 also had a rather high percentage of leaf roll though displaying little, if any, phloem discoloration. Katahdin, Essex, and X 1276-185 were considerably resistant to leaf roll and gave a zero reading for phloem necrosis.

Klostermeyer (E. C.). **The phloroglucinol test for diagnosis of leaf roll in Netted Gem Potatoes.**—*Plant Dis. Reptr*, 34, 2, pp. 36–38, 1950. [Multilithed.]

To determine whether the phloroglucinol method [*R.A.M.*, 27, p. 578] can be used to diagnose current season infection by leaf roll virus in Netted Gem (Russet Burbank) potatoes tests were made on infected plants. Necrotic flecking of the phloem, difficult to detect in the apical portion of the shoot, was rendered visible

as a red discoloration. Necrosis occurred in all cases of chronic infection, most abundantly in the stem base. Repeated tests showed the character to be a reliable means of diagnosis. Tubers from leaf roll plants did not react even when net necrosis was plainly visible. The test was not suited to White Rose unless the stem base was tested. *Physalis angulata* reacts in the same manner as the potato.

The use of this test on the stem apex makes it possible to determine leaf roll increase as the season advances, as frequent sampling can be made without destroying the plant. It also permits an unbiased determination of the disease without the uncertainty attaching to diagnosis based on external symptoms.

MEYER (ELSE). **Über den Wuchsstoff-Hemmstoffgehalt gesunder und abbaukranker Kartoffelknollen.** [On the auxin-anti-auxin content of healthy and 'degenerate' Potato tubers.]—*Planta*, 38, 2, pp. 213–232, 13 graphs, 1950.

In agreement with the results of previous studies [*R.A.M.*, 19, p. 238], the examination of Ackersegen potato tubers during the winter to spring of 1933–4, 1944–5, and 1945–6 revealed a reduction of some 50 per cent. in the total auxin content of severely diseased (leaf roll) material as compared with healthy. Auxin (susceptible to hydrogen peroxide treatment, resistant to hydrochloric acid) and heteroauxin (susceptible to both) constitute only the smaller proportion of the total growth substance content of healthy tubers. Anti-auxin (resistant to hydrogen peroxide, susceptible to hydrochloric acid) constitutes the greater part of the total growth substance content of healthy tubers but only the smaller portion in diseased ones. Anti-auxin is accompanied in both healthy and infected tubers by anti-auxin H, which is susceptible to hydrogen peroxide, and perhaps partially so to hydrochloric acid. It is proportionately more abundant in diseased than in healthy tubers. Combined treatment with hydrogen peroxide and hydrochloric acid destroys all auxins and anti-auxins in both healthy and leaf roll tubers.

BAWDEN (F. C.), KASSANIS (B.), & NIXON (H. L.). **The mechanical transmission and some properties of Potato paracrinkle virus.**—*J. gen. Microbiol.*, 4, 2, pp. 210–219, 1 pl., 1950.

At Rothamsted Experimental Station paracrinkle virus [*R.A.M.*, 27, p. 538] was transmitted with the aid of abrasives to Arran Victory potato plants by inoculation with sap from leaves of either symptomless infected King Edward or diseased Arran Victory plants. The proportion of plants that became infected was increased when they were kept in darkness for some days before inoculation. No abrasive was required to inoculate tomatoes, which remained symptomless, but electron microscopy showed the sap to contain rod-shaped particles of various lengths and about 10mμ wide; such particles were not observed in uninfected tomatoes and are presumed to be the virus. They were destroyed by heating at 60° C.

The nature of similar particles in King Edward and Arran Victory plants affected by paracrinkle is uncertain, as such particles were observed also in uninfected Arran Victory, in uninfected plants of all other potato varieties examined, and in newly raised potato seedlings; they were not transmitted by inoculation or grafting to tomato or other hosts tested, and resisted heating to 98°.

Darlington's theory [ibid., 23, p. 472] that the virus must have arisen by grafting and that it provides evidence that there is no essential difference between viruses and plasmagenes was partially disproved by Carson *et al.* [loc. cit.]. Darlington, however, has continued to relate paracrinkle virus with a plasmagene (*Coll. int. Centre nat. Rech. sci.* 8, p. 123, 1949) and has placed it in a group 'provirus', transmissible only by grafting. The results described in the present paper indicate that there is now no need to assume that the relationship between King Edward potatoes and paracrinkle differs in any way from that between any

other vegetatively propagated host and a virus that it tolerates. They invalidate the view that paracrinkle results from grafting and render unnecessary the concept that it is intrinsic to King Edward potatoes.

LANSADE (M.). **Essais de traitement du mildiou de la Pomme de terre.** [Trials for the control of Potato blight.]—*C. R. Acad. Agric. Fr.*, 35, 2, pp. 84–85, 1949.

Comparative spraying and dusting trials against potato blight (*Phytophthora infestans*) [cf. *R.A.M.*, 28, pp. 139, 140; 29, p. 227] at Versailles in 1948, showed that the best results were given (preventively) by mixtures containing 500 gm. copper per hl., especially Bordeaux mixture. Copper oxide and copper oxychloride were less satisfactory than Bordeaux mixture, and mixtures containing 125 or 250 gm. copper per hl. were ineffective. Copper dusts containing at least 15 to 20 per cent. copper could be recommended as supplementary treatments, but sodium and zinc ethylene bisdithiocarbamates (spray or dust) were often inferior to the other materials.

COOK (H. T.) & LUTZ (J. M.). **Relation of rainfall to time of development of Potato late blight in the field and to the importance of tuber rot in storage.**—*Plant Dis. Reptr*, 34, 1, pp. 15–18, 1 graph, 1950. [Multilithed.]

A storage test in 1948 of 31 test lots of potatoes from parts of 17 fields in the Red River Valley of North Dakota and Minnesota, in which different amounts of blight (*Phytophthora infestans*) [*R.A.M.*, 28, p. 638] were present at harvest, showed that in spite of severe foliage infection and the presence of many affected plants in parts of some fields, less than 1 per cent. of the harvested potatoes were infected. Tubers showing signs of decay were discarded. After approximately five and a half months' storage at an average temperature of 43° F. and relative humidity 82 per cent. there was still approximately the same percentage of affected potatoes in the test lots as at the start; marked increase occurred in only three lots.

A survey of the rainfall records indicates that the dry spell which followed rain during the infection period probably accounts for the low percentage of tuber rot in September. These data indicate that tuber rot from late blight is unlikely to be important in storage when an outbreak occurs early and is followed by dry weather during the late growing season and at harvest.

KAMMERMANN (N.). **Vad gör Potatisbladmögelsvampen under sommaren?** [What happens to the Potato blight fungus in the summer?]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1949*, 4, pp. 5–8, 1 fig., 1949.

During the first week or two of July, 1949, an outbreak of blight [*Phytophthora infestans*] developed on Early Puritan potatoes in an experimental field at the Plant Protection Institute, Bergshamra, Sweden. It presented the following remarkable features: exceptionally early occurrence, segregation in a continuous block of a few hundred square metres, and virtual restriction to the stems instead of the usual site on the leaves. From the brown, slightly sunken lesions on the stems the fungus passed into the small side shoots in the leaf axils, and spots were also observed here and there on the petioles.

There is reason to believe that *P. infestans*, under Swedish conditions, overwinters exclusively in the affected tubers, in which it is probably conveyed to the fields with material for the spring planting (see below, p. 430). The question now arises as to its mode of existence between this time and the late summer. Closer inspection of the plants involved in the attack under discussion revealed a number of lesions at the stem bases, which proved to be connected with underground infections. Similar observations were also made on isolated plants in apparently healthy stands. The pathogen had evidently migrated upwards from the tubers into the stems, and no doubt such inconspicuous infections form the

starting point for its subsequent depredations. The fungus can subsist for many weeks in the stem lesions, and a single night of high humidity suffices for copious mycelial and sporangial development, notably round the edges of the spots. The sporangia are freely disseminated by strong winds and splashing rain, and on reaching a suitable site, they rapidly produce hyphae which penetrate the susceptible plant organs and initiate a fresh cycle of infection. The lengthy delay between the precocious development of the fungus in the stem bases and the typical late summer epiphytotics may be explained, firstly, by the prevailing dry weather in June and July, which seldom permits of extensive sporangial production, and secondly by the varying degree of susceptibility of the foliage at different periods of growth, as illustrated by a recent experiment on Up-to-Date. In this experiment inoculated older leaves developed numerous lesions with a diameter of 20 to 30 mm., whereas the young foliage bore only a few spots of 8 to 10 mm. Furthermore, on incubation in a moist atmosphere the number of sporangia on those plants still flowering was only a fraction of that on the older ones. Evidently the former are provided with a self-protective mechanism which is lost about the time of flowering.

The Early Puritans attacked at the beginning of July had been severely damaged by hail, and the blight lesions developed to a great extent just round the injuries. It was shown by an inoculation experiment on wounded and unwounded stem segments that sporangial production was much more abundant on the former than on the latter, though both were penetrated with equal facility.

Steele (W. C.). **A useful machine for spraying Potatoes.**—*Qd agric. J.*, 70, 2, pp. 92–93, 2 figs., 1950.

Details are given of a cheaply constructed horse-drawn machine for spraying potatoes [against blight: *Phytophthora infestans*]. Spraying four rows at a time a maximum rate of 50 gals. per acre can be applied to give good, fine mist coverage. The machine can also be used to spray other crops. It consists of a 44-gallon drum fitted to a frame mounted on two 27-in. wheels, the span of which can be adjusted to allow for row widths of 27 to 33 in. A $\frac{3}{4}$-in. galvanized iron pipe leads from the rear of the drum to a brass rotary pump which forces the spray through to a boom fitted with three cyclone-type nozzles 8 in. apart. The pump is rotated by means of a gear wheel fitted to one of the land wheels, and driving a smaller cog on a countershaft. The boom can be adjusted to suit any height of crop.

Muncie (J. H.), Hatfield (M. R.), & Morofsky (W. F.). **Field tests of some new Potato fungicides.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 32, 3, pp. 275–278, 1950.

Comparative plot tests with certain new potato fungicides were conducted at the Lake City Experiment Station in 1949. Early blight [*Alternaria solani*: *R.A.M.*, 28, p. 638] appeared early in August but developed rather slowly. On Katahdin nine spray applications (at an average rate of 125 gals. per acre) of dithane D–14 and of G.C. 308 (copper nitrodithioacetate, General Chemical Company) gave outstanding control of early blight (5 and 5·25 per cent. defoliation, and 444·8 and 442·1 bush. per acre total yield, respectively). Good control was also achieved with 8–4–100 Bordeaux (9·1 and 426·6), 2–100 copper zinc chromate (9·5 and 409·1), and 6–100 cop-o-zinc (tribasic copper sulphate plus zinc; 9·75 and 409·1), compared with 44·37 and 388·3 for the control. On plots of Chippewa five dusts, applied eight times at 50 lb. per acre, effected no appreciable difference in early blight infection, which developed much more rapidly than in the Katahdin plots. The highest yields were obtained from plants dusted with cop-o-zinc (442·1 bush. per acre), copper zinc chromate (428·3), and four applications of zerlate followed by four of dithane Z-78 (428·3). In farm tests in five

counties, in all of which there was low early blight infection, only in Lapeer County were there significant differences, cop-o-zinc and tribasic copper sulphate sprays giving considerably higher yields than the grower's material, copper A.

Morofsky (W. F.) & Muncie (J. H.). **Effectiveness of certain insecticidal and fungicidal sprays in control of leafhoppers, aphids, flea beetles and early blight on Potatoes.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 32, 3, pp. 307–310, 1950.

In a field test carried out in 1949 on Russet Rural potatoes on a farm in Menominee county, Michigan, early blight [*Alternaria solani*: see preceding abstract] developed in mid-August and was severe on two plots sprayed with cop-o-zinc (total yield 384·6 bush. per acre) and tribasic copper sulphate (367), respectively. The most effective control was with 8–4–100 Bordeaux mixture (445·5).

Reddick (D.) & Peterson (L. C.). **Additional blight-resistant varieties.**—*Amer. Potato J.*, 27, 1, pp. 1–10, 1950.

Of the new potato varieties, resistant to blight (*Phytophthora infestans*), released for increase to growers [*R.A.M.*, 27, p. 151; 28, pp. 352, 483], the early maturing Essex (in whose parentage Rural New Yorker, *Solanum demissum*, Alma, and Triumph participated) is a prolific yielder and well adapted to areas with cool and moist seasons. In the field it has contracted neither leaf roll nor rugose mosaic (virus Y), but in tests it proved to be susceptible to both. Graft inoculations with scions infected with virus X gave no reactions; it is not known whether it is immune or a symptom-less carrier. The late maturing Glenmeer has the same pedigree as Essex. It is drought-resistant and tolerant of frost and a very heavy cropper. It is susceptible to leaf roll, virus Y, and scab [*Actinomyces scabies*]. The heat- and drought-tolerant Madison, a result of straight back-crossing with *S. demissum*, matures early, but is subject to leaf roll, virus Y, and scab. Fillmore is related to Empire [ibid., 25, p. 276]. It is late-maturing, is susceptible to leaf roll and scab, and is a symptom-less carrier of virus Y. Cortland originates from a cross between *S. demissum* and Russet Rural. It is tolerant of virus X, susceptible to leaf roll, virus Y, and scab. In Florida it proved also very susceptible to early blight [*Alternaria solani*]. In tests in Cortland County, New York, it was one of the three highest yielding varieties for three successive years. It was exceeded by Empire and Fillmore and equalled by Harford, another blight-resistant release. In western New York, however, it was outyielded by all varieties tested in 1946.

Marth (P. C.) & Schultz (E. S.). **Effect of growth regulators on sprouting of stored table stock Potatoes and on waste piles for control of diseases.**—*Amer. Potato J.*, 27, 1, pp. 23–32, 2 figs., 1950.

Experiments were conducted from 1944 to 1948 at Beltsville, Maryland, to determine the inhibitory effects of various growth regulators on the sprouting of potato tubers in store and also in refuse piles, which are the primary source of infection for blight (*Phytophthora infestans*) [*R.A.M.*, 22, p. 493]. In the greenhouse piles of treated tubers were made with layers of moistened, shredded sphagnum moss, and kept at 65° to 75° F. In field experiments waste or cull potatoes were sprayed with growth regulators when the tubers were deposited on the piles.

Preliminary greenhouse studies with blight-infected Katahdin tubers indicated that dips or sprays of α-napthalene acetic acid at 2,000 p.p.m. prevented sprouting. The infected tubers rotted quickly, often before the effects of the growth regulators could be evaluated, and in further experiments tubers free from blight were used. Sprouts were completely inhibited by 0·25 per cent. 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). In preliminary field experiments 2,4,5-T (acid) spray at 2,500

p.p.m. prevented sprouting in piles of 1 to 1½ barrels. Spraying with 2,4,5-T (½ gal. per barrel of tubers) did not prevent sprouting of tubers within the pile, and the result suggested that applications of the volatile ester forms of 2,4,5-T might be more effective. This was confirmed in a further test, when three esters of 2,4,5-T (isopropyl, butyl, and methyl) applied as an aqueous suspension of 0·25 per cent. concentration prevented or completely checked sprouting, without causing tuber injury.

Bonde (R.) & Covell (Mildred). **Effect of host variety and other factors on pathogenicity of Potato ring-rot bacteria.**—*Phytopathology*, 40, 2, pp. 161–172, 1950.

At the Maine Agricultural Experiment Station three methods of inoculation with *Corynebacterium sepedonicum* were compared on susceptible Katahdin and Green Mountain seed pieces, the resistant variety President, and 13 selected resistant potato seedlings [*R.A.M.*, 27, p. 37; 29, p. 117]. None of the resistant varieties contracted infection from smearing freshly cut surfaces prior to planting with bacterial exudates from diseased tubers, whereas Katahdin and Green Mountain developed 70 and 82·3 per cent., respectively.

Effective methods of inoculation were the immersion of freshly cut seed pieces in a bacterial suspension, pricking a suspension of the pathogen into the eyes of seed pieces, or rubbing the inoculum into eyes and sprouts. In the resistant varieties, however, the incidence of infection was relatively low even when these drastic methods were applied. For instance, in one test combining all the inoculation treatments, the average percentage of ring rot in the resistant Teton was 1·1 as compared with 99·2 in Katahdin. The bacteria from definitely infected tubers of Teton [ibid., 28, p. 416] were more virulent (9·8 times) than those from Katahdin. The former variety appears to be less likely than the latter to be a masked carrier of the disease. There was significantly less tuber rot in infected Teton than in diseased Katahdin plants.

De Carvalho (T.). **Uma doença da Batateira (Sclerotium rolfsii Sacc.).** [A Potato disease (*Sclerotium rolfsii* Sacc.).]—*Gaz. Agric., Moçambique*, 2, 12, pp. 107–109, 2 figs., 1950.

Sclerotium rolfsii was isolated in pure culture from the stems of potatoes growing in marshland at Umpala, Mozambique.

Hastings (Lucy). **Presence of the two most destructive Rice pathogens in Costa Rica.**—*Plant Dis. Reptr*, 33, 11, pp. 439–440, 1949. [Mimeographed.]

Studies of germinating rice seeds and seedlings in Costa Rica indicated that the spores of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, 28, pp. 486, 641; 29, p. 12; C.M.I. map no. 92] are carried on and within the seed. In several seed treatment tests ceresan gave highly significant increases in stand and plant weight.

Piricularia oryzae [ibid., 28, p. 486; 29, p. 11; C.M.I. map no. 51] was found on the rice varieties Magnolia and Nira from western Costa Rica, where the disease causes considerable losses. The fungus was easily isolated from seed of the affected plants.

Davis (L. L.). **California Rice production.**—*Circ. Calif. agric. Ext. Serv.* 163, 54 pp., 16 pl., 33 figs., 1 graph, 1 map, 1950.

On p. 52 of this circular it is stated that rice diseases in California are of no economic importance. Although stem rot (*Leptosphaeria salvinii*) [*R.A.M.*, 27, p. 176] has been present in the crops for several years, it has caused no damage. The incidence of black chaff disease, the causal organism of which has not been

determined, appears to be more widespread in late seasons or on late-maturing crops. In some cases only the hulls are discoloured; in others the grain has a blackened surface and is immature and chalky. Neither control measures nor resistant varieties are known.

CARPENTER (J. B.) & LANGFORD (M. H.). **Target leaf spot of Hevea Rubber in Costa Rica.**—*Plant Dis. Reptr*, 34, 2, p. 56, 1950. [Multilithed.].

In December, 1947, the *Hevea* rubber clone FX-1041 in the nurseries of the United States Department of Agriculture Co-operative Rubber Plant Field Station, Turrialba, Costa Rica, developed infection by *Pellicularia filamentosa* [*Corticium solani*: *R.A.M.*, 29, p. 382]. The infected leaves were destroyed, but the disease recurred in July, 1949, on clone FX-642, when all infected material was again destroyed.

Small-scale inoculation tests at Tingo María showed that *C. solani* from *Dolichos hosei*, *Phaseolus calcaratus*, and *Melinis minutiflora* was pathogenic to rubber inoculated with infected leaf tissue or pure cultures of the fungus. As the climatic conditions at Turrialba resemble those at Tingo María, the disease is a potential threat in Costa Rica.

COHEN (C.). **An examination of the methods used for isolating soil fungi.**—*S. Afr. J. Sci.*, 46, 10, pp. 281–283, 1950.

From an examination at Iowa State College of some of the usual microbiological techniques commonly adopted for the isolation of soil fungi it is concluded that all should prove useful if the fact is borne in mind that they present results which require careful examination before they are accepted. Mere counting of colonies may lend itself to statistical analysis without presenting anything like a true picture of the soil fungus flora. Dilution of the soil suspension entailed a loss of some species. It is felt that the development of certain methods [*R.A.M.*, 20, p. 177; 28, p. 240] will be very useful in working with soil fungi. Certain genera and species require special treatment, while others only require a more rigid standardization of the methods at present in use. But in any case each type of soil should be treated for its own individual peculiarities. Storage of soils may result in low numbers of detectable species. Isolates obtained at 10° C. [from one sample] were mostly different from those isolated at room temperature. Ability to grow well on a medium is not necessarily indicative of the frequency with which an organism may be isolated.

WOODBRIDGE (C. G.). **The role of boron in the agricultural regions of the Pacific Northwest.**—*Sci. Mon., N.Y.*, 70, 2, pp. 97–104, 7 figs., 1950.

The effects of boron deficiency on a number of fruit, vegetable, and other agricultural crops in the Pacific Northwest are described. Depending on the boron requirement of the individual species, the timely application of borax or boric acid at rates varying from 10 to 50 lb. per acre is usually effective, but the extreme complexity of the conditions governing the use of the element necessitates studies on the particular crop concerned, previous fertilizer practices, and climatic variances.

Control of 'sudden death' disease. Felling plan abandoned.—*The Times, London*, No. 51,721, 19th June, p. 5, 1950.

Owing to the possibility of serious resistance on the part of the Arab growers, the British Government have abandoned the proposal to control 'sudden death' of cloves in Zanzibar [*R.A.M.*, 29, p. 382] by felling. A recent survey disclosed that the number of trees which would have to be destroyed is very much higher than the original estimate of 60,000, and the cost would probably be £1,000,000 rather than £200,000.